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SURGICAL ESSAYS:

THE RESULT OF

CLINICAL OBSERVATIONS

MADE AT

GUY'S HOSPITAL.

By B. B. COOPER, F.R.S.,

SURGEON OF GUY'S HOSPITAL, LECTURER ON ANATOMY,

&c. &c. &c.

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TO

BENJAMIN HARRISON, ESQ.

TREASURER OF GUY'S HOSPITAL, &c. &c.

My Dear Sir,

I beg leave to dedicate the following Essays to you, as it enables me publicly to thank you for the many acts of friendship which you have constantly extended towards me; and it also gives me an opportunity of acknowledging, that the source from which I have gained my information has depended as much upon your zealous and active management in the affairs of Guy's Hospital, as upon the situation of Surgeon, which I have the honor to hold through your kind selection.

I have much pleasure,

My Dear Sir,

In subscribing myself,

Your very grateful and humble Servant,

BRANSBY B. COOPER.

PREFACE.

The object of this Publication is, to give to the world a collection of cases, occurring in Hospital practice, systematically arranged, and the views that immediately influenced their mode of treatment.

Such a Work, can scarcely fail of being highly instructive, when it is considered, that the Hospital Surgeon who becomes the narrator of his own practice, is enabled from the wide field presented to him, at all times to select cases in illustration of the principles it is his endeavour to elucidate. He also can shew upon what his success, or his failure has depended; and has the satisfaction of knowing, that his matter is not distorted by passing through another medium, and being himself only answerable for its authenticity.

A report thus conducted, will, in some measure, embrace the advantage of a series of Clinical Lectures, and will, if the comparison may be allowed, resemble the preparations in a well arranged Museum, which by juxta-position, and connection, tend to establish a regulated illustration of Surgical, and Pathological phenomena.

The benefit conferred upon the community by the establishment of large Hospitals, resolves itself into

two points; of which the most ostensible, undoubtedly is the charitable and gratuitous treatment of the afflicted poor; but it may be averred, that the second is, if not of greater, yet of equal moment, namely, the education of professional practitioners. A Hospital thus contains within its walls, not only the patients and those to whom their treatment is committed, but schools, both of medicine and surgery, wherein the principles of the healing art, are in daily illustration for the contemplation of the Student: and where a centre is formed, from which the radii of professional education and practice, may be said to emanate, and where its most valuable precepts are constantly drawn to a focus.

The intention of the Author may therefore be easily divined, it is simply to concentrate all facts of practical importance, and apply them in accordance with the principles he teaches, both as a Lecturer and a Surgeon. However the Author may have acquitted himself of the task, he cannot but believe, that the greatest benefit is to be derived, by communicating to the profession in general, the results of those advantages afforded by a large public Hospital; in which, all the professional improvements of the day, are continually receiving the confirmation of practical experience.

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SURGICAL ESSAYS.

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ON THE PHYSIOLOGY OF THE GROWTH, AND REPARATION OF BONE.

As I have in the first volume of my Anatomy, entered into the Physiology of the Bones, detailing the particulars of their structure, texture, growth, re-production, chemical composition, and diseased appearances, it is now my intention, from such physiological views, combined with practical experience, to deduce just principles for the treatment of the diseases and injuries of the osseous system.

But before I enter into the consideration of the means by which nature repairs either injuries or diseases of the bones, it will be first necessary to take a cursory view of the formation of healthy bone.

The hardness which forms the great characteristic of bone, too frequently leads the surgeon to consider this physical property as separating the osseous system, and the phenomena attending the diseases incident to it, entirely from the same vital influence experienced in the changes attending the diseased actions of the softer parts. But upon investigation, it will be found that the same laws preside in both instances; modified, however, in the former, by the presence of a proportion of earthy matter, which differs in quantity not only in different bones, but in separate parts of the same bone.

By many eminent surgeons this earthy matter has been considered and described as being inorganized; but it is hardly to be conceived that dead matter can exist in connection with living, without producing the ill effects experienced by the presence of all extraneous substances. Ought we

not rather to consider that the phosphate of lime, when combined and united with the softer animal constituents of the bone, is, as much under the peculiar influence of life, as the bases of these animal constituents themselves; and, consequently, that no analogy can be drawn between phosphate of lime, forming part of the living body, and when separated from it?

We have an evidence of this fact in the disease termed *Necrosis*, in which there is a separation of the animal and earthy parts of bone; the latter being no longer capable of sustaining an independent existence, acts as an extraneous substance, and is immediately thrown off by the same process as a slough of soft parts.

This peculiar modification, constituting the difference between the osseous and softer structures of the body, refers principally to the presence and quantity of phosphate of lime, in the inverse proportion to which the degree of vitality in a bone depends, as well as the number of blood-vessels which it receives.

Hence, therefore, the progress of reparation, or any diseased action, is rendered slow or rapid in proportion to the preponderance of earthy or animal matter; those parts which are most compact, repairing injuries with less rapidity than the more spongy.

It having been generally admitted, that the reparation and growth of bone are governed by the same laws, and subject to the same process, it will be right to give a slight sketch of the view I entertain upon this subject.

In the embryo, at the earlier periods of uterine gestation, there is no apparent difference in the rudiments of the future osseous system, and the other animal structures,—the whole constituting a membranous mass, containing a soft gelatinous semifluid matter. From the seventh to the eight week after conception, some of those parts, which in future are destined to perform functions requiring strength and solidity, become the subject of ossific deposition; so that the osseous system is not completed all at the same moment, but progressively,

as its use may be required. This law not only holds good in fœtal life, but after birth; thus we find that parts of the bones remain cartilaginous, even until the age of puberty, at which period the muscular system being fully developed, the perfect osseous formation is required for its support. It may hence be deduced, that there is some principle of stimulus to the formation of bone. John Hunter attempted to identify this action by the term "*stimulus of necessity;*" but as we are not capable of comprehending the primitive cause of ossification, we cannot therefore but fail in conveying any correct idea upon the subject. We may, however, learn from watching the process of nature, that from her perfecting such bones as shall first be required, her principle should seem to be, that the exercise of the function for which they are intended, is the natural stimulus to the growth of bone. In illustration of this point, I will suppose a deficiency in the bony union of a fractured limb; to excite which, I should apply such an apparatus as would enable the patient to bear upon the fractured extremities of the bone, considering weight, and the attempt to perform the natural actions of the limb, the proper stimulus to the process required to produce ossific deposition. Indeed the same fact holds good with respect to every structure of the body. The elasticity of cartilage, is maintained by the constant concussion produced by exertion; the flexibility of ligament, is only preserved by the natural motions of the joint to which it belongs; the sensibility of the retina, loses its integrity by the continued absence of light; and muscular motion will be lost, if long in a state of disuse:—and hence we may fairly infer, that not only the perfection of a part is maintained, but its efforts of restoration are accelerated by their employment.

Having taken these considerations, we will now proceed to those changes which are demonstrable in the progress of the growth of bone. In utero, we have already described that the process of ossification commences by the conversion of a fluid into a firmer gelatinous mass, that it proceeds by

the deposition of albumen forming cartilage, and that it is completed by the deposition of animal matter, with such a proportion of phosphate of lime as forms bone. After the birth of a seven months child, the ossific process was found to have proceeded to the following extent. The clavicle had an epiphysis at each extremity; the scapula had four epiphyses, one at the superior, and a second at the inferior angle, the acromion was attached to the body of the scapula by a third, while the fourth united the glenoid cavity and the corocoid process, constituting what is termed the cervix scapulæ; the edges of the posterior costæ were also cartilaginous. The os humeri had two epiphyses, one at each extremity, uniting the head and condyles to the ossified shaft of the bone. The radius and the ulna, had each their heads and inferior extremities united by epiphyses to their shafts. The bones of the carpus were completely cartilaginous; but the metacarpal bones were ossified in the centre of their bodies, having each extremity cartilaginous. The os femoris had its head and two trochanters united to the upper extremity of the body of the bone by one epiphysis, while the condyles were connected to the lower extremity by another. The patella was wholly cartilaginous; the tibia and fibula had epiphyses of about half an inch in extent at each extremity; the tarsal bones were cartilaginous, excepting the astragalus and os calcis, which had each a small spot of earth denoting an advance towards ossification beyond the other bones. The metatarsal bones had each two epiphyses.

On examining the extent of ossification of the bones of the upper compared with those of the lower extremity, we find that the former were the more advanced, which is consistent with physiology; as they are destined to be called much earlier into use, and require, therefore, a greater degree of solidity. The vertebræ of the neck had made less progress towards ossification than those of the back and loins, having only a small spot of earth in them, while in the remaining portion of the vertebral column they were two thirds ossified.

The ribs were nearly completed in their formation, their heads being only somewhat more cartilaginous than in after-periods. The sternum presented three principal spots of earth, one in the centre of the upper, and two in the middle piece; there were however small particles of earth dispersed in various parts. The ossa innominata were cartilaginous at their cristæ; that part of the ilium which enters into the acetabulum, was entirely cartilaginous, as was also the similar part of the ischium; the tuberosity and ramus of the ischium, were also cartilaginous. The portions of the sacrum had begun to ossify, but had not proceeded to an equal degree with the lumbar vertebræ—the earth was deposited in the centre of each piece; the os coccygis was wholly cartilaginous.

We here see, in taking a view of this comparative process of ossification of the osseous parities of the chest and abdomen, that the same law holds good,—that part being first completed which has first to perform an important function. In the chest, the perfection of respiration depends upon the integrity of the ribs; while in the abdomen, although the organs are immediately upon birth, called into action, yet their function does not so much depend upon the solidity of the osseous system, as upon the action of muscle.

Our object next must be to examine the structures which are immediately destined for the formation of bone, and respecting which there seems to be considerable diversity of opinion. By some, the periosteum alone has been supposed to be the agent, and that the internal medullary membrane is only destined to the production of marrow. Others have maintained, that the external periosteum produces the earthy parts, and that the internal or medullary membrane deposits the animal constituents; and this they were led to infer, from finding that the blood-vessels were differently distributed to the two membranes. It appears however to me, that the external and internal periosteum, with their connecting cellular tissue, bear in every respect a strict resemblance to the cellular neurilema of a nerve,—the membranous

covering and cellular connecting medium of the intimate parts of a muscle, — and the parenchyma of the various viscera, each being for the same purpose—that of forming a nidus for the products eliminated from the blood under the unknown influence of the vital principle.

That the medullary membrane is essential to the growth of bone, may be proved, by the experiment of passing a wire up the medullary canal of the femur of a dog, when the inflammation which is consequently set up immediately extends to the external periosteum, shewing their intimate connection: from which we may infer, that we cannot divide this membranous apparatus for the formation of bone into parts differing in function; but that the formation of the osseous system depends upon the integrity of the whole. It is true, that, in the formation of separate bones, there is a difference in the arrangement of the membranes: thus, in the flat bones, the cellular connection between the external and internal periosteum, leads to such an arrangement of osseous deposit, as is termed diploe; while in the irregular bones, it is spongy; and in the shafts of long bones, a solid compact deposition is formed. Therefore, it is not to be considered that any one part, but the whole of this membranous apparatus, is destined for the formation and reproduction of bone.

If a bone be broken, the first appearance which takes place is the effusion of blood, filling up the spaces between the fractured extremities, and even the lamella of the bone itself. The compact part of the bone not being so vascular, cannot pour out the same quantity of blood as the softer parts; which may have led some physiologists to the belief, that the internal periosteum has more to do in the growth of bone than the external: while the truth is, that the circumstance depends upon a physical, and not a vital principle, namely, its greater density. This blood, is by some supposed to be wholly absorbed; and by others, that its red particles are removed, and the fibrin becomes organized, assisting in the process of reparation. Sir Astley Cooper is

of opinion, with many others, that it is wholly absorbed, and does not assist in producing a union between the ends of the bones. An inflammation is next set up, about the fourth day, commencing simultaneously in the whole extent of the periosteum; by which I mean, the external, internal, and intermediate cellular tissue, which is described as proceeding from the bone. This inflammation leads to the effusion of a gelatinous fluid, which continues to be thrown out for several days, becoming gradually firmer until it constitutes the callus; resembling in every respect the cartilaginous substance which the arteries of the fœtus deposit for the original formation of bone.

This cartilage in the same manner also is by degrees absorbed, its blood-vessels simultaneously becoming evident, conveying red blood, and depositing the new bone in patches, and without any apparent order. When a fracture is so produced, either by accident or by an experiment, that the fractured extremities of the bone are not separated, there appears a rim of callus, formed around the fracture, between the external periosteum and the bone itself. Where the periosteum is extensively lacerated, the production of bone still goes on, partly from the denuded surface, and partly from the surrounding soft structures. So that the common cellular tissue is convertible into periosteum, or a substance capable of performing the same function, when in contact with the granulations arising from bone, which it cannot be until the periosteum has been destroyed. Thus periosteum may be considered, as not only useful in distributing its blood-vessels for the formation of bone, but also as constituting the limit between the osseous and the other tissues. On this account it is that inflammation upon the osteal side of periosteum leads to the formation of bone, while on the muscular surface it terminates either in the adhesive or suppurative inflammation.

These facts are distinctly demonstrable in cases of compound fracture, when the granulations proceeding from bone become covered by a periosteum, produced by the

surrounding cellular tissue, and not till then are the granulations hardened into bone.

Having thus premised what appears to me to be the principles, governing the processes of the reparation as well as the growth of bone, I shall now proceed to the consideration of fractures, and their general treatment.

ON FRACTURES IN GENERAL.

When a surgeon is called to a case of fracture, his mind is not only to be directed by mere mechanical rules to the coaptation of the injured bone, but there are important physiological circumstances essentially appertaining to the judicious treatment of such accidents; for instance, it should be remembered that the bones have been divided into flat, long, and irregular. Nor has this division been merely to designate their geometrical figures, but to lead to physiological facts of importance. Thus, flat bones form cavities for the protection of important organs,—are united by sinarthrodial articulations, and are not influenced therefore by the action of muscles. Hence the surgeon has not to regard the injuries to the bones, so much, as the safety of the organs contained within them.

The long bones are connected to each other by means to facilitate their motion, and are influenced also by numerous muscles; so that when they are fractured, their broken extremities are separated, more or less, and require mechanical means not only for their coaptation, but also to retain them in their proper position:—a difficulty in proportion to the number, and size of the muscles attached to the injured bone.

In the irregular bones, the physiological view of the means to be employed for their reparation after injury, differs from the preceding, in consequence of their possessing a greater degree of vitality; and being subjected, therefore, to a higher inflammatory action, requiring constitutional, rather than mechanical means for their restoration.

Fractures of the Flat Bones.

The bones of the cranium, connected as they are with the important and vital parts constituting the brain and its membranes, and being moreover closely united by those membranes for the better support of the parts they contain, it seldom or ever occurs that a fracture happens to the cranium without injury to the brain or its appendages. The danger which arises from a simple fracture of the cranium is, therefore, dependant upon the degree of injury sustained by the brain, and not from the fracture of the bone itself. And hence these accidents are principally characterised by the symptoms attendant upon the consequent state of the nervous system. In severe blows upon the head, the consequence is generally, either that of concussion, or compression of the brain; and it will be necessary to consider the symptoms in either case, although they may occur without actual fracture of the bone. In cases of *concussion*, the patient is stunned, the pulse weak and fluttering, the face pale, and the extremities cold; these symptoms occur immediately after the accident, and they continue until a reaction commences, when a new train is presented. The patient now remains in a half comatose state, with his senses weakened but not lost, and his power of volition suspended but not destroyed. If he be addressed loudly by his name, he is capable of giving a rational answer, and when thus roused, his pulse is found to rise from its natural number to a hundred and twenty. In simple concussion, the pupils of the eyes have a natural appearance, and are capable of being stimulated by light,—nausea and even vomiting are frequently concomitant symptoms.

In *compression*, a complete comatose state comes on, and the senses and volition are entirely lost. The pulse is small, labouring, and hard; generally irregular, and sometimes intermitting. The pupils are dilated, and the retina insensible to light, occasionally one pupil will be dilated and the other contracted; and more rarely, both sides will be

contracted. There is, however, no symptom, either in concussion or compression, more difficult to estimate as a diagnostic mark than the state of the pupil. I am, however, inclined to consider contraction of the pupils as an unfavourable symptom, pourtraying destruction of the nevous influence of the eye, and consequently great degree of injury to the brain. The breathing is stertorous. When the injury is very severe, hemiplegia is produced, and most frequently on the opposite side to that on which the injury has been received. These various symptoms may arise, either from the pressure of bone upon the brain, from extravasation of blood, effusion of serum, or from the formation of matter.

If from the pressure of bone, the symptoms will come on immediately after the accident; and the irregularity of the bone may be detected by a careful examination, made by the pressure of the finger steadily upon the part. Steady and firm pressure is necessary, in order to prevent the deception arising from the swelling of the scalp, which to an inexperienced practitioner communicates a feeling as if the bone were depressed; but which feeling, gives way upon firm pressure.

When extravasation of blood, or effusion of serum, occasions the symptoms of compression, they come on gradually after the accident; sometimes, hours and even days elapse before they are fully developed, depending either upon the size of the vessel ruptured, or the degree of subsequent inflammation.

Lastly,—when matter forms, days and even weeks may intervene, previous to the accession of the symptoms,—they are always preceded by a train of indications similar to the formation of matter in either parts of the body,—such as pains and rigors, after which, symptoms of compression occur, violent in proportion to the quickness and quantity of matter formed. Such symptoms lead to the necessity of surgical means for the removal of the matter. But a difficulty occurs to ascertain the precise point of the situation of the pus: puffiness of the scalp, easy separation of the pericranium,

and the ashy color of the bone, form the marks by which, the surgeon is authorised to use the trephine.

Too frequently, these symptoms come on insidiously, unattended with pain; but the surgeon should examine the scalp with care, when he will find the seat of injury still marked by a puffy state. Where the scalp has been wounded, the formation of matter may be more clearly pointed out. When this occurs, the edges of the wound, which were before healthy, will assume a glossy appearance, and the discharge becomes thin and ichorous.

The inner table of the bones of the skull is sometimes fractured, while the external one remains entire: such an accident renders the diagnosis extremely difficult, because there are no external signs of the seat of the injury; or should there be any contusions of the exterior of the skull, still the fracture would probably be upon the opposite side, from what is termed a *contre coup*.

The effects of this accident would not come on until some time after the infliction of the injury, when effusion between the dura mater, and the inner table of the skull, would produce compression on the brain, and simultaneously a puffiness of the scalp externally, which would point out the seat of injury. In such a case, the dura mater is first separated, and the pericranium subsequently; the converse, however, more frequently happens, that the pericranium is first separated, and the dura mater subsequently; but, in either case, the train of symptoms which follow, are precisely the same.

The treatment of both concussion and compression, are the same, so soon as reaction has taken place; which, however, is sometimes so slow in making its appearance, that it becomes necessary to employ stimuli, to restore the patient sufficiently, that he may be enabled to bear the means necessary to be employed. As soon as the pulse indicates the reaction, blood should be taken from either the jugular vein or the temporal artery, in such a quantity as may be considered expedient, regulated by the powers of the patient. A large dose of calomel, from eight to ten grains, should be

immediately administered; which, if the patient cannot swallow, should be passed into the fauces upon a piece of butter, which is a better vehicle than any other, as it melts from the heat of the mouth, and allows the calomel from its gravity to find its way to the fauces. The head should be shaved, and evaporating lotions applied, a sinapism should also be applied to the soles of the feet, and small doses of the sulphate of magnesia given every hour until the bowels are freely opened. Should the symptoms not be relieved by the application of cold, a blister should be applied to the scalp. If all these means fail, under what circumstances is the trephine to be applied?

If, attending these symptoms that I have described, there be a wound communicating with the bones of the cranium, accompanied with fracture and depression, or if there be fracture and depression, without a wound of the soft parts, or if there be puffiness of the scalp, either immediately after, or coming on, subsequently to the injury, then the surgeon is right in trephining; but, on the contrary, even if all these circumstances present themselves, but without the detailed symptoms, there is no evidence of the brain being injured, and therefore, I would recommend that the patient should be narrowly watched, and that the trephine should not be applied, until symptoms do point out the necessity.

Bones of the Pelvis.

The flat bones of the pelvis, when fractured, lead to much the same pathological considerations as in injuries to the flat bones of the head; namely, that the viscera which these bones protect, are the principal objects of attention. The viscera contained within the cavity of the pelvis are, however, of less vital importance, and therefore, rarely lead to the necessity of any surgical operation to remove the depressed portions of bone; although strict attention to the antiphlogistic regimen is equally necessary, either to prevent the occurrence, or to obviate the effects of subsequent inflammation.

From the manner in which the bones of the pelvis are covered with soft parts, and from their immobility upon one another, it is frequently very difficult to detect fractures in them. The following plan, will, however, usually lead to sufficient diagnostic marks to judge of the nature of the injury.

Since great violence, such as the passage of a heavy weight, or a fall from a considerable height, is usually the cause of these injuries, producing at the same time extensive contusion of the soft parts, such a history, with the following train of symptoms, would lead to the suspicion of the bones of the pelvis being broken.

Upon the patient being directed to move the buttocks only an inch towards either side in his bed, a deep-seated pain will be immediately felt, rendering him utterly incapable of motion; and at the same time, he expresses a sensation of crepitus, or grating of the bones upon each other, forming a second diagnostic mark.

The surgeon should next place the patient in a perfect horizontal posture, and examine if the anterior and superior spinous processes are on a level, and if the lower extremities are of the same length; when a want of symmetry in either of these instances, would necessarily indicate displacement of the bones of the pelvis. I should here recommend, before the surgeon attempts to discover which of the bones of the pelvis has sustained the injury, that he should first pass a catheter into the bladder, to discover whether or not the urethra has been injured; for in the force necessary to ascertain the seat of injury to the bones, an additional laceration of the urinary apparatus might be inflicted, and which may be avoided, by having ascertained in the passage of the catheter either the safety or injured state of these parts.

For should bloody urine, or difficulty of passing the catheter, denote fracture of the pubes, the surgeon would immediately fasten the catheter in the bladder, and apply a broad belt tightly around the pelvis, to keep the bones in

perfect apposition; the patient should be kept strictly in the recumbent posture, and not be permitted to use the slightest muscular exertion. This object may be accomplished by a second broad girth being passed under the nates, the ends of which are to be attached to a pulley suspended from the top of the bed, and thus the patient may be raised without any effort of his own. With these mechanical means, the strictest antiphlogistic regimen is to be adopted, constitutionally to diminish the tendency to a formation of matter.

The employment of the force necessary to discover the precise situation of the fracture of the ossa innominata, I should consider always liable to produce more injury than that for which the discovery can compensate; and, for myself, I usually submit the patient to the above treatment, without exposing him to what I deem to be unnecessary violence; considering the inability of the patient to move the pelvis, in the least degree, as a sufficient indication of the extent of the injury.

The *sacrum* differs from the rest of the bones of the pelvis under accidents, by inducing paralysis of the lower extremities; pointing out, that this bone is not only for the purpose of forming a part of the osseous cavity of the pelvis, but also in assisting to protect the lower part of the spinal marrow. Injuries to this bone, therefore, would lead to a more unfavourable prognosis than fracture to the other parts of the pelvis, because, being like them deeply seated, the same degree of violence is necessary to produce a fracture, the same contusion occurs to the external soft parts, and the same danger arises of the formation of matter, and the ill consequence of inflammation to the neighbouring contained viscera—superadded to the injury of the spinal marrow.

The treatment in such cases is precisely such as has been recommended for fractures of the other portions of the pelvis, both as it regards the security of the broken bones in just apposition, and the precautions necessary respecting the urethra and bladder.

In fractures of the *os coccygis*, which occur but seldom

from the depth of its situation, and from the motion of which it is capable, there is considerable pain in the coccygeal region. This accident may be ascertained by examination, *per rectum;* the pain is much increased by any attempt to walk, in consequence of a few of the fibres of the gluteus maximus, which take their origin from this bone, and act in displacing the fractured portions.

No kind of apparatus can be applied, to assist the reunion of this bone. Rest, poultices, and the antiphlogistic regimen, are to be strictly employed, to prevent the occurrence of suppuration.

I will now proceed to detail such cases, that have lately occurred in my practice at Guy's Hospital, which are most eligible to illustrate the foregoing principles.

The first is one of compression of the brain, attended with very urgent symptoms, although the depression of bone was inconsiderable.

CASE.

Michael Curley, aged 17, was admitted into Guy's Hospital, on 9th July, 1832. It was reported by the persons who brought him, that he had been thrown from his master's horse, against the wheel of an approaching carriage. On his admission, he was totally insensible, his lower jaw was fractured in several places, and the mucous membrane within the mouth so lacerated, as to render the fracture compound. His pupils were contracted, and inobedient to light; his breathing stertorous; his pulse slow and labouring; and no attempt to rouse him, produced the slightest effect, either on his mind, or his pulse. He had bleeding from the nose, and from both ears, rather more from the right than the left. The temperature of the body was natural, being the only favorable symptom that presented itself. Before I saw him he had been examined by the dresser, who could not detect any depression of bone, although there was great swelling and puffiness over the posterior and inferior angle of the right parietal bone. He was bled to twelve ounces, and ten grains of calomel were administered. Two hours after the bleeding, the pulse became fuller and softer, and the breathing more natural. The bowels not having yet been evacuated, a colocynth enema was given; his head was shaved, and a cold evaporating lotion ordered to be constantly applied.

On the 10th, his bowels had been freely opened, but he had passed

very little urine, rendering the use of the catheter necessary. His pulse had again become laborious, indicating cerebral affection, and his breathing was stertorous; he was therefore again bled, and when six ounces had been drawn, the pulse became much softer, the pupils more dilated, although still perfectly inactive. At twelve o'clock this day I saw the patient, and found him still quite insensible, the pupils being again contracted, and inobedient to stimuli; the pulse, although soft, was still labouring.

The constitutional remedies having failed, I made a careful examination of the head, and found a puffy tumor, as already mentioned, at the posterior and inferior angle of the right parietal bone; and determined, therefore, to cut down upon this part, to examine the state of the bone underneath, when I found the pericranium was separated from the skull to some extent, by an effusion of bloody serum. Upon cutting through this membrane, a portion of bone was brought into view, which was slightly depressed, but sufficient, in my opinion, to account for the foregoing symptoms. I therefore determined immediately to elevate the depressed portion of bone, as the only chance remaining to save the patient's life. A small angle of bone was first removed with Hey's saw, and the depressed portion thus raised by the elevator. A fracture was now perceived, extending downwards towards the base of the skull; and although there was some slight overlapping of the edges of the bone, all pressure on the brain seemed entirely to be removed.

During the operation, the patient moaned greatly when any pressure was made upon the part; and immediately after the operation, the pupils contracted, on the admission of light,—which shewed, satisfactorily, that the cause of their former inobedience was removed.

On the 11th, he appeared to know his father, seemed conscious of what was said to him, but could not speak; the pulse and breathing natural.

12th.—Passed a restless night, tossing himself about, and moaning; pulse 98, and rather sharp. An enema of colocynth was ordered, which had the desired effect; the tongue was moist.

13th.—Had again passed a restless night; perfectly understood what was said to him, but was still unable to speak. This symptom, according to Dr. Foville, of Rouen, would be attributable to some lesion of the hypocampus major; upon the integrity of which, in his opinion, the power of speech depends.

From the 15th up to the 4th of August, he seemed to improve in every respect, having, however, occasionally slight strabismus of the left eye,—another proof of the injury to the deeper parts of the brain.

On the 5th of August, probably from some irregularity of diet of which he had been guilty, he complained of pain in the head, and of a

return of his restless nights, accompanied with frightful dreams; he talked incoherently, fancying he is going to ride his masters horse in a match for 1000*l.* indicative according to Dr. Foville, of inflammation of the cortical parts of the brain and its membranes. He was ordered two grains of calomel and five of the extract hyoscyamus, with a blister to the back of the neck. Some doubt may exist in the mind of the medical profession as to the propriety of administering narcotics in disturbed function of the brain, but as in this case, I attributed the accession of cerebral disturbance somewhat to irritative fever, I ventured therefore the trial, and it proved highly beneficial. From that period he has gradually been getting better, and upon his discharge from the hospital, he suffered no inconvenience excepting from some pieces of bone which were exfoliating from the jaw, the fracture of that bone having perfectly united.

On reviewing this case, and taking all the points into consideration, it was quite clear that the brain was suffering, at this time, from some cause, not in any way removed by the constitutional means which had been adopted. The contracted state of the pupils, and their inobedience to light, I looked upon as a symptom of the greatest danger, indicating more injury to the brain, than when they are dilated. In this, I believe I may differ in opinion with many excellent surgeons; but in those cases where I have had an opportunity of examining the brain after death, of those who had been the subjects of injury to the head, and having had a dilated pupil on one side, and contracted upon the other, the violence done to the brain was generally greatest on the side corresponding to the contraction. And further, that with contraction of the pupil, fatal terminations have been more frequent. We also find, that persons who die a sudden death, and where life has been destroyed by a narcotic poison, that the pupils are contracted.

The next symptom of importance which struck my attention, was the stertorous breathing, which is an undoubted indication of pressure upon the brain; and as it was present immediately upon the occurrence of the injury, it indicated, that it was either from depression of bone, or extravasation of blood from a large vessel. The state of the pulse, slow and labouring, is equally indicative of compression; and may

be known from the pulse attending simple concussion, by its not being increased by any attempt to rouse the patient. The bleeding from the ears and nose, denotes injury to the base of the brain, which is a bad symptom, as injuries to the inferior parts of the brain, are more dangerous, in consequence of the vital functions more particularly in connection with it. The natural temperature of the body being maintained, was a favourable symptom, as we find any great injury done to a vital organ, is followed by a cold clammy sweat, and general pallor.

May it not be deduced from this case, that if there be symptoms of compression of the brain, unalleviated by constitutional means, and attended with any external marks of injury to the bones of the cranium, that the surgeon is authorised, or rather called upon to examine by incision, the real state of the bone; and if there be depression, or even any signs indicative either of fracture or any morbid change, immediately to use the trephine.

The next case is one of simple concussion attended with bleeding from the ear.

CASE.

Richard Howe, aged 19, was admitted into the accident ward on the 22d of June, and the following account was received with him. That on endeavouring to raise a sack of wool with an instrument called a jerry, the hooks tore away from the sack, and he fell from the warehouse window of the first floor upon his right thoulder, and afterwards on his head. His companion believed that as he fell with the jerry in his hand, one of the hooks had pierced his ear; which was more than probable from the quantity of bleeding from it, there was a slight wound, merely superficial, upon the superior part of the cranium.

When I first saw him, which was soon after his admission, there was still bleeding from the ear; his face was pallid and cold; his pulse weak, 80 in number, and compressible; his pupils dilated, but obedient to light; it was difficult to rouse him, but on calling loudly by his name he answered, and his pulse immediately became rapid. He also expressed great pain on his head being touched; the right clavicle was fractured, and his left hand was severely contused; reaction soon occurring,

I ordered him to be bled, ten grains of calomel to be given immediately, and the clavicle to be set. After the bleeding his pulse became feeble and his feet cold, upon which bottles of hot water were applied to them, and he soon rallied.

On the 23d it was reported to me at 12 M. that he had passed a restless night; his pulse were 60, labouring, and somewhat irregular; breathing natural; pupils also natural; the bowels had been freely opened; the bleeding from the ears still continued, but more of a serous than a bloody character. There was considerable difficulty in keeping him quiet from his constantly rolling in his bed, complaining at the same time of great pain in his clavicle. At 3 P. M. being still very restless, I ordered him to be again bled; and upon his having lost about six ounces his pulse rose, became regular, and more powerful. He remained however restless during the whole day; he was ordered a grain of colomel every six hours and to drink lemonade.

24th.—The bleeding from the ear still continued; has become more sensible; but from some conversation I had with his parents, there was reason to suspect that he had always been dull of comprehension. His pupils were now natural, bowels open, and the pulse regular.

25th.—Bleeding from the ear still continued; the tongue covered with white fur, and his countenance somewhat flushed; he complained also of some pain in the head; the bowels were open, and the urine natural; twelve leeches were applied to the temple, and a blister to the back of the neck, and the calomel and lemonade continued.

26th.—In every respect improved, and said he was perfectly unconscious of what had transpired since he had been in the hospital. The bleeding from the ear has now ceased, and he continued gradually recovering until the 8th of July, when he was considered convalescent and dicharged.

The peculiarities of this case are the quantity of blood lost from the ear, with the extent of cerebral disturbance, and yet the early period of his convalescence. It is probable that the brain received its injury merely from concussion, and that the bleeding at the ear was not caused by any fracture of the base, but from the hook of the instrument which he had in his hand having wounded that organ. All the symptoms of concussion are in this case well marked, and yielded to the usual remedies. I may here mention, that I have seen several cases in Guy's Hospital, some of which were under the care of my colleagues, as well as myself, in which a serous discharge continued from the ear for a considerable

length of time after the accident; and in all such cases, to the best of my recollection, the patients recovered. One case in particular, I remember, under the care of Mr. Key, in which the symptoms of injury to the brain were very urgent; but in consequence of the serous discharge from the ear, a favourable result was correctly prognosticated. The manner in which this discharge operates favourably is difficult to comprehend; but, however, as my experience leads me to a belief of its salutary effects, I consider it worthy of observation.

The next case which I shall detail is one which offers some important pathological observations, in reference to the extent of injury which the bones of the head are capable of sustaining, and without any cerebral symptoms.

CASE.

Joseph Cole, aged 5 years, was admitted the 8th of October, under my care, into Guy's Hospital, with a compound fractured cranium, without any symptoms of compression. The accident happened in the following manner:—He was playing under the window of a warehouse, out of which a conical piece of iron fell from the height of ten feet upon the boy's head. It made a wound just at the junction of the sagittal with the lambdoidal suture, conspicuously depressing both tables of the bone, so as to expose the pulsations of the brain. The portion of depressed bone was about as large as a shilling. He was perfectly sensible upon his admission, but it was reported that he was stunned at the time of receiving the blow. His pupils were quite natural, nor did he labour under a single cerebral symptom. The edges of the wound were brought together, he was bled from the jugular vein to four ounces, and ordered three grains of calomel immediately, with lemonade as a beverage, if he complained of thirst.

9th.—The bowels have been twice freely opened, his pulse quick, and his tongue white; a grain of calomel was ordered twice a day with salines, and his diet to be low. On the third day after his admission the wound was dressed; it was found that no adhesive inflammation had occurred, but some slight degree of suppuration was apparent; directed to continue the same plan of treatment:—in fact, by strict attention to diet, and by repeated doses of calomel, he progressively continued to recover without the occurrence of a single bad symptom. The wound granulated, and at the end of a month he left the hospital perfectly recovered.

In my opinion, no case can better illustrate the propriety of leaving to nature the reparation of injured bone, where the brain has not suffered from the accident, and trusting wholly to constitutional means of preventing subsequent inflammation of the brain, and its membranes. It would have been impossible, by any mechanical means, to have elevated the depressed bone, without having inflicted an injury to the brain, which, from the absence of all symptoms, it clearly had not yet sustained. From this case, then, as well as from experience generally, I should say, never remove a portion of the bones of the skull, unless there be direct evidence of its affecting either the brain or its membranes.

CASE.

Richard Slatter, aged 30, was brought into the accident ward of Guy's Hospital, on the 11th of June, labouring under symptoms of concussion of the brain, occasioned by the wheel of a gig passing over his head.

Upon his first admission, his pulse were full, but compressible, and about fifty; his pupils were dilated, the right rather more than the left; his skin rather cooler, than natural; he complained of great pain on the forehead, and over the left ear, but it was difficult to obtain any answer from him when spoken to. A short time after he had been put to bed, he had considerable hæmorrhage from the left ear, and from the nose, no bleeding having occurred before this period. He complained of nausea and giddiness, and was constantly rolling from side to side in his bed, and moaning as if in great pain. The pulse now became hard and labouring, the skin hot, and all the symptoms of reaction coming on, he was bled to sixteen ounces, eight grains of calomel were given to him, and a common enema was administered.

On the 12th, he had passed a good night, and was free from restlessness, his skin was cool, bowels had been well opened, the pupils remained however dilated, but he was quite sensible. His tongue was covered with a brown fur, and he complained of great pain over the forehead and left ear.

Applicentur Temporibus CC. c ferro ad ℥x. Repet. enema.

13th.—At about 10 o'clock, A. M. all the symptoms of compression came on: stertorous breathing; entire loss of volition and sensation; twitchings of the left side of the face; extremities became quite cold. At 2, P. M., no pulse could be felt at the wrist, and at half-past three he died.

Post mortem examination.—The occipital bone was divided by a fracture passing perpendicularly from the centre of the lambdoidal suture, to the foramen magnum, a small portion of the edge of which was broken off on the left side. Opposite to this fracture, a considerable coagulum of blood was found between the dura mater and base of the skull; a small fissure also passed through the petrous portion of the left temporal bone; no blood was effused between the dura and pia mater, but both of these membranes were of a bright red color. The cerebrum was found lacerated on the anterior lobes, but the laceration did not extend deeply into the substance of the brain. The cerebellum was also slightly lacerated.

From this case, we may learn that laceration of the cerebrum, if at the same time no large blood-vessel be torn through, produces no farther symptoms than those of concussion; while, perhaps, we may judge that the degree of suffering in this patient, was an indication of laceration of the cerebellum, as found in the post mortem examination. The subsequent accession of the symptoms of compression, appears to have been the result of the slow effusion of blood between the skull and the dura mater; while the extent of injury shews, that nothing farther could have been done for relief of the patient; for as the coagulum was at the base of the skull, there could be no external signs which could lead the surgeon to detect its presence. Therefore, injuries to the base of the skull, lead to a more unfavourable prognosis than in other parts of the cranium.

The following case presents one of the greatest difficulties which can occur in surgery, in consequence of fracture of the bones of the head, and for which no remedy is known.

CASE

Of Hernia Cerebri, with extensive destruction of Brain.

Michael Monyham, aged 8 years, was admitted into Luke's ward, on the 30th of July, with fracture of the cranium. The humerus, and two ribs on the right side, were also broken. His mother stated, that he had fallen from a window two stories high, and struck his head against the edge of an iron boiler. Immediately after the accident, he breathed with great difficulty; there was a wound on the scalp, three inches in

length, extending from a small distance beyond the coronal suture, near the superior edge of the parietal bone on the right side, to the prominence indicating the situation of the frontal sinus. Upon examining the wound, I detected a fracture, with depression; and therefore, as there was difficulty of breathing, and other symptoms indicating cerebral injury, I enlarged the wound, elevated the bone, and removed several detached portions; the dura mater was wounded by the bone, and a small portion of brain, with its coverings, protruded through an opening in the dura mater. After the operation, the child became quiet, and fell asleep; the pupils however remained dilated, and but little sensible to light; the pulse was frequent.

℞. Hydr: Subm: gr. v. statim sumend.
℞. Magnes: sulph: ʒi.
Liq: Ammon: Acetat: ʒiij.
Aquæ Puræ ℥i. 3trs. horis sumend.

31st.—Morning, perfectly sensible, free from all symptoms of compression, answered a question quickly and properly. Respiration hurried, pulse frequent, bowels not been opened; and there was an unnatural heat about the forehead.

Applicentur Hirudines xii. Temporibus.
℞. Hydr: Subm: gr i. 4tâ. quâque horâ.
Enema, Colocynth statim injiciend.

Evening—the respiration had become very difficult, quick, and painful; mucous rattle in the bronchial tubes; pulse 140, and hard; he continued sensible, but complained of pain in the head. This disturbance was in some measure attributed to the tension of the contused scalp, and perhaps the confinement of pus. The adhesive straps were therefore removed, and cold lotion applied to the head and temples. He was bled to four ounces, which caused syncope, and afterwards vomiting, which gave immediate relief, the pulse directly losing its hardness.

Habeat: Pulv: Jalap c. Hydr: Subm: gr. vi.

August 1st.—He did not sleep during the night, and at intervals he was delirious; respiration, however, was not so quick; skin hot, and dry, and he complains of intense thirst; pulse 140, full, but soft; bowels had been freely evacuated; tongue dry, and furred; head very hot.

Applicentur Hirudines vi. Temporibus.

2nd.—The appearance of the child much improved; he is to-day cheerful, and quite free from pain; has much less heat of the skin, which is moist; pulse 100, and soft; tongue moist, but covered with fur; respiration free, and equal; thirst less urgent; bowels open.

Poultice to be applied to the head.

Evening—Complains of great pain in the side; respiration hurried; pulse frequent, full, but soft; temperature of the skin below the natural standard; thirst urgent, and the patient in a very irritable condition; heat of the forehead intense; poultice ordered to be removed, and an evaporating lotion constantly to be applied.

3rd.—Morning—Passed an exceedingly restless night, and is now very ill, constantly moaning; respiration very quick, accompanied with a loud mucous rattle; tongue dry, and of a dark brown color; teeth and lips covered with the same fur as the tongue; pulse quick and small; bowels open.

Evening—not at all improved, but appears more debilitated, and is unwilling to answer any questions. Bowels very open, fæces and urine pass involuntarily.

4th.—Somewhat improved; respiration neither so loud or quick. On examining the side on which the ribs were broken, a sensation resembling a combination of emphysema and crepitus from fracture, was felt over the ribs and sternum; a bandage was applied around the chest, which gave him great relief; pulse not so frequent; and he continued sensible.

5th.—Greatly improved, quite cheerful, even merry, and he replied to questions without inconvenience. Respiration calm, and natural; cough not so frequent; skin warm, and moist; pulse 96, soft and regular; tongue moist, and clear at the edges; bowels open, and the sphincter ani has regained its power. The wound on the head discharged a large quantity of healthy pus, the edges widely separated, but had otherwise a healthy appearance.

Bread and water poultice to be continually applied.

8th.—Was asleep when visited; pulse quick, and rather hard; breathing regular; had slept well during the night; bowels confined.

P. Jalap: c. Hydr: Subm: gr. vi.

9th.—Was again asleep when visited, and had been in the same state nearly the whole of yesterday, never asking for any thing; pulse full, and quick; skin intensely hot, and very dry; has passed an exceedingly restless night, frequently moaning, as if in pain.

Purgative powder repeated, which procured an evacuation from the bowels.

11th.—During the whole of yesterday, and this morning, in a state of coma, sleeping continually, and with great difficulty roused; but when disturbed, complains of great pain of the head, and side; bowels not open.

Sumat Statim, Hydr: Subm: gr. ii.
Pulv: Antimon: gr. iij.

13th.—Much better, does not complain of pain of the head or side; respiration natural; was relieved immediately upon the operation of the purgative medicine, which was administered in large quantities before any effect could be produced; Cal. and Jalap twice, with saline medicines, and Colocynth enema; pulse quick; tongue covered with a dirty fur; thirst urgent; for the last two or three days a portion of exuberant granulation, which is usually considered brain, protruded through the wound, to-day rising far above the level of the edges of the wound, and discharging a large quantity of healthy pus.

17th.—The general symptoms had improved; the skin was cooler, although dry; breathing quite easy, and regular; still complains of great pain of the head, about the situation of the wound. The protruded portion of the brain had the appearance of being covered with a slough, which was partly removed by the slightest use of a sponge.

Cold lime water was ordered constantly to be applied.

21st.—Symptoms increased in urgency, great heat of skin, oppressive and constant thirst, pulse quick, tongue dry and furred, respiration hurried. Frequently exclaiming "oh! my head," the pain recurring at short intervals with great severity; when asked how he was he invariably answered, "very well, excepting that his head was now and then very painful."

℞. Hydr: Subm: gr. ij.
P. Antim: gr. iij. h: somni sum:
et proximâ aurorâ Haust. Sennæ.

24th.—Symptoms greatly aggravated; countenance flushed and anxious; he is extremely irritable, complaining of pain in every part of his body; had been very restless during the nights, and at intervals delirious. The granulation from the brain has greatly increased in size, its surface being covered with a dark ragged slough, part of which was removed without exciting the slightest pain. Pulse not quite so quick, but the carotid arteries beat unusually strong and frequently; he was almost incessantly complaining of thirst; bowels open; tongue furred and dry.

25th.—He had been delirious almost all the night; this morning he is quiet, breathing very sonorously; was with difficulty roused, and when he had answered a question he instantly relapsed into his former state of coma. The pupils were dilated and insensible to light, and the cornea are covered with an opaque film. Pulse very quick and irregular.

26th.—Continued much in the same condition as yesterday, until eleven o'clock this morning, when he died.

Sectio Cadaveris.—The body much emaciated. We were not permitted to examine any part but the head; the tumour which was formed

on the right side of the forehead was in a state of sloughing, and the bone through which it protruded was to some extent denuded of periosteum, discolored, and separated by a distinct groove of demarcation from the healthy bone. The structure of the tumour was scarcely to be discovered on account of its sloughy condition, but it looked as if a membrane covered it. The dura mater around the opening, from which the fungus protruded, and that portion corresponding with the dead bone of the skull, was covered with a film of coagulable lymph, having lost its glossy surface, presenting a blackish gray color; a small splinter of bone protruded; and the membrane to a still greater extent, had a white opaque appearance, looking tense, with no marks of convolutions beneath; and around the opaque part might be traced a vascular zone. The brain was carefully removed with the upper part of the dura mater still attached: the dura mater was then raised and was found to adhere firmly to the arachnoid membrane near the diseased part, and more particularly around the edges of what appeared to be an abcess, where the adhesions were so firm as scarcely to admit of its being raised without tearing the brain; when, however, it was removed, a deposit of well-formed pus was exposed, running backwards from the fungus, and the parieties of the abcess had attempted to form a false membrane. At first, this gave the idea of its being a deep abcess in the substance of the brain, but on further examination, the vessels of the arachnoid were seen dipping down under the pus; and when the pus was removed with the handle of a scalpel, a depression of nearly a quarter of an inch was found in some parts, in which the pus was lodged external to the arachnoid membrane, which was quite perfect to the edge of the fungoid tumour, and then was lost in the sloughy fungus. In one small spot about the size of a pea, it was doubtful whether the arachnoid membrane was not ulcerated through; and here the pus was found to form a deposit in the substance of the brain not larger than a French bean: this seeming to communicate, although imperfectly, with the external deposit of pus. A small collection of pus was likewise situated externally to the arachnoid on the left anterior lobe. A section was then made perpendicularly through the fungus into the ventricle, and through the corpus striatum of the right side. A broken mass of red, brown, and curd color, with which the fungus was connected, extended to the surface of the ventricle, but had not opened into it. Round the broken mass several red points were visible in the substance of the brain, like small ecchymoses, such as are usually seen around a portion of brain broken by an apoplectic clot. In the posterior cornu of the right ventricle pus was deposited, and the surface appeared rough and softened; but as this had not been examined until two days after the removal of the brain, the

appearances were not so satisfactory. A considerable quantity of pus lay between the arachnoid membrane and the brain at the base, over the upper surface of the cerebellum, and at the under surface of the middle lobe of the cerebrum.

In these cases of what are termed Hernia Cerebri, concomitant with fracture of the bones of the head, and injury to the membranes of the brain, it appears to me that there are two very important questions involved; first, whether the protruded excrescence be brain, or not; and secondly, what is to be the mode of practice in such cases? I am inclined to believe that the protrusion is not brain, but an exuberant granulation arising from the highly vascular pia mater, and protruding so readily, in consequence of the perfect manner in which the cavity of the cranium is filled by the brain; so that when the dura mater is wounded, these granulations immediately perforate the torn membrane, meeting no resistance in that direction, and presenting that peculiar protrusion termed hernia cerebri. Slicing off these projections I consider dangerous as well as useless:—dangerous from their great vascularity, and consequent tendency to bleed; and useless from the extreme rapidity with which they again sprout up after excision. Pressure seems to be dangerous, as it can only mechanically prevent the protrusion, and in that direction too where alone it can happen with impunity; for directly it is pressed upon, the brain must suffer, and symptoms of compression necessarily supervene. I believe the best treatment in these cases to be, the application of some gently restringent wash, kept constantly applied and perfectly cold, for the purpose of destroying the granulations, by cutting off their supply of blood by this local application; and at the same time by the strict antiphlogistic regimen, constitutionally to diminish the flow of blood to the head. The granulations which arise from the testicle after chronic abcess, and ulceration of the tunica albuginea, resemble very much the exuberant granulation of wounded brain; but from the comparative little vital importance of the testicle to the brain, the prognosis is very

different; although in that case, even the testicle is always so disorganized as rarely to perform its function after this disease. The hernia cerebri cannot occur unless the dura mater be in part destroyed, either by the nature of the accident or by subsequent inflammation; so that it is of the greatest importance in removing portions of the bones of the skull, to avoid injury to that membrane, which indeed, is the great source of danger in all injuries to the head; depression and fracture of bone being frequently of comparative little importance; hence, in my opinion, the frequent cause in failure of the use of the trephine, producing such disturbance to the dura mater, in separating the circular portion of bone from it, as to lead to subsequent cerebral symptoms.

A wax model of the head and the protruding portion of brain is preserved in the Museum of Guy's Hospital: and in Vol. II., Plate XII., Figures 1, 2, & 3, of Dr. Bright's Reports of Medical Cases, there are beautiful delineations of the morbid appearances upon dissection.

The following case differs from those which I have already cited, in consequence of the great period which elapsed after the accident, before any surgical means were employed to relieve the cerebral symptoms arising from the blow inflicted.

Ann Moore Cobb, a married woman, aged 26, who has had two children, and who, previous to the commencement of her present illness had been healthy, was admitted, April 24th, 1833, with cerebral symptoms arising from a blow.—Upon her admission, there was an opening in the integuments of the forehead, the edges of which were inverted, and from it there was a slight discharge. Her husband states, that about two years since, she received a blow on the right side of the forehead, from a stone, which partially stunned her, and gave her some little pain; this, however, soon subsided, although there was a recurrence of pain, at intervals; there was no laceration, or bruise of the scalp caused by this blow. Five or six months after this, without being able to assign any cause, a considerable swelling took place at the inner canthus of the left eye, and at the upper part of the nose; her head, however, was not all affected. She consulted a surgeon, who ordered

her to apply six leeches to the part; the leech-bites, however, ulcerated, suppurated, and an open sore was formed, which continued discharging unhealthy and offensive pus, for six months, when it healed without any exfoliation taking place. Soon after this, while reaching something on the fire, her foot slipped, and she struck her head against the mantel-piece, which caused considerable pain and swelling of the part, the pain being at its worst when she was hot in bed; for this she applied leeches, once or twice a week, for three weeks; these somewhat reduced the pain and swelling. Being recommended to try the sea-air, she went to Ramsgate, where she continued for three months, gradually improving, until she returned to town last August, tolerably well; but at this time began to suffer from incontinence of urine, and remained so until November, when she again struck her forehead against the mantel-piece, over the left eye, on the seat of the present sore. The effect of this was, the reproduction of the pain and swelling of the scalp, which continued for five weeks, when it broke, forming a sore, and has been discharging ever since. In January last, had first a slight epileptic fit; they soon increased in number, having sometimes two or three in a week. Since she received the last blow, her menstrua have been very irregular.

One month since, her husband first perceived that she spoke in a peculiar, slow, and odd manner, at the same time complaining of excessive pain at the upper part of the head. Since then, her speech has become gradually worse. Her pulse is slow, and labouring; her left pupil dilated, and insensible to light. She speaks in a peculiar, slow manner, sometimes almost amounting to stuttering. She has incontinence of urine, but can command her motions perfectly. She had also great sickness, with which she has suffered from the whole time, and suffusion of the countenance. Memory is not in the least impaired.

℞ Hydr: Subm: gr. iss. Quâque 4tâ. horâ.

The medicine soon affected her mouth, and its immediate consequence seemed to be slight relief from her suffering, but she soon relapsed, and then continued getting worse, in every respect, excepting the incontinence of urine.

A consultation was held on the case, and it was deemed expedient that the trephine should be had recourse to. The operation for trephining was, therefore, performed on Wednesday, May the 8th, at one o'clock.

A crucial incision was made down upon the bone, the longitudinal part of it being a little to the left of the centre of the forehead, and through the sore. Upon examining the bone, it was found extensively diseased, thickened, and uneven; a portion was then removed, rather to the left of the cicatrix, or sore. The trephine went through the

thickened outer part of the bone very quickly, but the internal table was excessively hard, and difficult to penetrate. There appeared to be no diploe, and the internal plate was of a peculiar ivory hardness; at one part it was nearly half an inch thick, at the other side much less; it was, however, removed without in the least degree wounding or injuring the dura mater. The edges of the wound were brought together by sutures and adhesive plaster, and the patient put to bed.

℞ Tr: Hyoscyami gt. xv.
Vin: Ipecac: gt. xv.
Mist: Camp: ℥iss. M. stat. sumend.

Immediately after the operation, the left pupil contracted, and became sensible to light. Has had frequent recurrence of fits during the whole of the evening. Pulse quick, and irritable; bowels not open since the operation; pupils contract to light; can now command her water perfectly.

9th. Has had frequent fits during the night, but slept in the intervals; complains of pain in the head; speaks rather better than before the operation; power of the bladder restored, but the sickness continues; the left pupil rather more dilated than the right, but contractile; bowels not open since the operation; tongue coated, and rather dry; complains of great pain in the head.

8 P. M. Bowels not open since the operation; pulse small and wiry; tongue furred, and dry; skin moist; she lies in a state very near approaching to coma; the right pupil is now rather more dilated, both however are perfectly contractile; some little sickness. Ordered a common enema immediately.

10th.—Slept tolerably well; countenance rather improved; articulation more clear; has had no recurrence of fits, since the night after the operation; great pain in her head; very slight sickness; pulse 90, small and feeble; says she feels excessively weak, and languid; bowels not yet opened; a castor oil enema was therefore ordered.

℞ Cal: gr. i. 4trs. horis sumend. Lemonade. Beef Tea.

Wound dressed, looking very healthy.

Her bowels not having been opened by the castor oil enema, a common house enema was administered, which had the effect of doing so freely.

11th. Slept pretty well; speaks much clearer; still, however, great pain in the head; bowels open; tongue clearer, and moist; pulse 84, languid; pupils somewhat dilated, but contractile; commands her water perfectly; wound looks healthy; no sickness, or recurrence of the fits.

13th.—Sleeps better; bowels open; tongue slightly coated, and

moist; pulse 86, still weak; articulation and mode of speaking improved; less pain in her head; complains that her mouth is rather sore. Ordered to take the calomel every six hours.

15th.—Is improved in every respect; speaks better; less pain in the head; pupils contractile; the sickness is entirely gone; commands her water; no recurrence of fits; pulse 80, rather improved in tone; tongue nearly clean; bowels open; wound dressed, looking healthy; says her mouth is very sore, there is, however, very little fœtor. Ordered to take the calomel every eight hours.

18th.—Sleeps much better; has less pain in the head; pupils contract to light; no fits; commands her water; no sickness; speech very much improved; bowels open; tongue a little coated, but moist; skin natural; wound granulating and healthy in appearance. Ate some fish for dinner to day, says she enjoyed it; mouth more sore. Ordered the calomel night and morning.

26th.—Continues improving; her mouth is now very sore, to leave off the calomel; bowels open; tongue coated, but moist; pupils contract to light; no fits, or sickness; commands her water; complains of some slight increase of pain in the head.

Applicentur Hirudines xij. Reg: occipit: et postea applicentur emplast: lyttæ.

24th.—Continues improving in every respect.

28th.—Much improved, although she has still a very slight drawl in her articulation of particular words; bowels open; tongue cleaner, mouth very sore; pupils contract to light; no fits or sickness; can command her water perfectly; is now quite cheerful.

From this period she was so near a state of convalescence, that no daily reports were taken, nor did any symptom occur, until about the 4th of June, when she got up, and in walking in the ward, was seized with a violent epileptic fit; from this, however, she soon recovered, and has not since had any recurrence, although she has twice been up for a short time.

At the present time, 24th, she is perfectly free from every cerebral affection, while she remains quiet; but upon any excitement, while in the erect posture, she complains of slight giddiness, perhaps in some measure attributable to the strict antiphlogistic discipline to which she has been so long subjected.

In this case, from the peculiar change in the structure of the bones of the skull, as evinced by the portion which was removed, there may arise some doubt, first, whether or not the cerebral symptoms arose from this morbid change, and also if the change itself was the result of the injuries as

described to have been inflicted; for it is not very uncommon to find these morbid changes in the bones of the head without their being traceable to any local cause, and producing symptoms very similar to those described.

Mr. Lever, one of my pupils, residing at Woolwich, shewed me a few days since a portion of skull precisely similar in structure to the piece removed from Mrs. Cobb, which had been taken from a person who had died from cerebral symptoms, in many respects corresponding to hers. It may be a question, therefore, how the trephine can have been beneficial in her cure, of which there can be no doubt, the symptoms being immediately relieved by the removal of the portion of bone; the answer appears to be, that relief may have been given to the circulation of blood through the brain, by diminishing the degree of tension on that organ, as well as by the counter irritation which was necessarily set up, not only by the operation itself, but also continued during the process of reparation.

The surgical principles which should regulate the treatment of fractures of the flat bones of the pelvis have already been described. I shall now, therefore, proceed to detail such cases as have fallen under my care in Guy's Hospital. Merely recalling to your recollection, that as the bones of the pelvis are not united by moveable joints, they are not individually influenced by the action of muscles; and that therefore, when injured, the surgeon is not so much called upon for the application of any mechanical means to keep the fractured portions of bone in apposition, as by constitutional means to prevent the effects of inflammation on the viscera of the pelvis.

CASE,

Of Fracture of the Right Ilium.

Robert Rozier, aged 14, was admitted into Guy's Hospital, on the 20th December, 1830, being the subject of severe injury from a fall on board a ship. He stated, that on the night of the 18th, he fell from the rigging of a vessel to which he belongs, and alighted on his hip; the height from which he fell being, he supposed, about forty feet. He

was stunned by the fall, for a short time, and on recovering himself, he found he was unable to stand, and that attempts to do so, gave him very great pain. Upon his admission into the Hospital, he complained of being severely hurt: upon attempting to raise him from the board on which he was brought, he expressed great anxiety to have some support for his pelvis, whilst they were removing him to his bed, seeming to have great suffering when his abdominal muscles were called into action to support the weight of the lower part of his body. Motion of the right thigh, also, gave him great pain; but he did not complain if the head of the femur was forcibly pressed into the acetabulum.

When he was placed in bed, a catheter was passed, and his urine, which was healthy, was drawn off,—indicating the safety of the urinary organs. On pressing firmly on the dorsum ilii with one hand, grasping the anterior and superior spinous process of the right ilium with the other, and moving it at the same time, a crepitus was distinctly felt,—marking, evidently, a fracture, separating the superior spinous process, and about a fourth of the crista of the ilium from the rest of the bone. But although the fractured portion possessed so great a degree of unnatural mobility upon the rest of the ilium, no displacement was evident by mere inspection.

Twenty leeches were ordered to the injured part, and after the bleeding had ceased, the constant application of evaporating lotions.

Cal: and Colocynth pills, and purgative mixture were also prescribed.

A long bandage was applied around the pelvis, and the upper part of the right thigh. By this bandage, pressure was made sufficiently firm as to confine the fractured portion.

January 4th.—The antiphlogistic plan has been persisted in, and he is, in every respect, doing well. He has to-day got out of bed, he can stand very well, but walks lame, keeping the thigh of the right side slightly flexed, so that he bears his weight chiefly on the toes.

12th.—There is now but very slight pain on moving his thigh, and his lameness is every day becoming less.

17th.—There being now no pain, or scarcely any lameness, he was presented, on the 18th of January, as perfectly cured.

On the 10th of February, the boy walked up from Deptford to Guy's Hospital, to inquire if he might go to sea. He is perfectly well, but after walking to fatigue, he says he feels a slight weakness in the seat of the fracture.

This case well exemplifies how little is to be dreaded from simple fracture of the bones of the pelvis; only taking care, by constitutional means, to prevent any inflammation extending to the viscera.

CASE.

James Hubble, aged 50. On the 23rd of April, whilst employed at some water-works at Lambeth, in endeavouring with some other men to raise by means of machinery, the boiler of a steam-engine weighing five tons, out of a barge, one of the chains broke, and a large bar of iron and a log of wood, which were bearing the weight of the boiler fell upon him, and threw him backwards into the barge; he was immediately conveyed to Guy's Hospital upon a shutter, and placed in bed, when I directly saw him. Upon examination, I found a compound fracture of the pubes, extensive laceration of the abdominal viscera, so as to expose the anterior surface of the bladder, which was also rent. From the appearance of the left thigh, I was led to believe it was dislocated, but upon examination, found that its deformity depended upon the displacement of the ossa innominata, which were so comminuted, that on placing the hand on any part of the pelvis, crepitus was readily felt. The patient's countenance indicated anxiety, rather than pain, a cold perspiration stood upon his forehead, and his face was deadly pale, his pulse were hardly to be felt, his extremities were cold, but he was perfectly sensible and resigned to a fate, which he seemed to feel no human means could obviate. Still it is a surgeon's duty to consider that while there is life, there is hope, and at any rate to do every thing which can be done to relieve a patient's suffering. I therefore immediately ordered him 40 drops of laudanum, in the julep ammoniæ, passed a catheter into his bladder, which was done, however, with some difficulty from the displacement of the urethra, and drew off a small quantity of bloody urine; I also ordered a broad belt to be put around the pelvis, so as to keep the parts in apposition and prevent any motion from the action of the respiratory muscles. This, however, could not be complied with, for the motion necessary to pass the bandage around him produced so much suffering, and his dissolution was so fast approaching, that it appeared a cruel disturbance to his last moments. In half an hour after his admission into the Hospital, he expired, and appeared sensible as he breathed his last.

There need no comments upon this case, it speaks sufficiently for itself, that the degree of injury was more than nature could sustain, as indicated principally by the immediate prostration of all constitutional power, while yet the mental powers retained all their faculties to the last, and seemed only to cease with the cessation of all the vital functions,

The following case can scarcely be described as a fracture of the bones of the pelvis, but rather as a separation at their

articulatory surfaces. As the effects, however, and treatment, are so similar, it is proper enough to consider these accidents together, rather than under the separate head of dislocation.

CASE.

Richard White, aged 22, was admitted into Guy's Hospital, on the 30th of July, 1832, from having sustained a severe injury, in consequence of a large quantity of gravel having fallen on his back, while in the act of stooping, which knocked him down. On rising, which he did with considerable difficulty, he attempted to walk, which produced a violent pain in the region of the bladder, extending upwards in the course of the ureters to the kidnies. He describes, that the urine he has made since the accident, has been bloody, and passed with difficulty.

On examination, a fissure was found at the symphysis pubis, producing a separation to the space of two fingers' breadth. On pressure being made on any part of the ilium, he complained of an increase of pain in the region of the pubes, and of numbness, extending down the left thigh.

Upon his admission into the Hospital, a catheter was immediately passed into the bladder, and the urine which was drawn off, was clear and healthy; leeches were applied over the pubes, and a broad belt was firmly buckled round the pelvis, sufficiently tight to bring the separated pubes nearly in contact; and the patient ordered to be kept perfectly quiet, in the recumbent posture, and upon low diet. The leech-bites ulcerated, and some slight degree of fever resulted, which, however, readily yielded to the usual treatment.

He remained in the Hospital for three months, without any check to the progress of his cure; but the length of time being accounted for, by the difficulty of reparation in an amphiarthrodial articulation. And when he left, there was some slight separation still remaining between the pubes, nor were the two lower extremities, or the anterior and superior spinous processes of the ilia, perfectly symmetrical, although he could walk very well.

It may be seen by this case, that precisely the same means were adopted, both locally and constitutionally, as would have been employed in fracture of these bones.

Fractures of the Spine.

The accidents to the bones of the spine, may very properly follow the consideration of those of flat bones, for in

both, the danger arises from the injury done to the important organs they are destined to protect, and not from any difficulty arising, either in their adjustment, or their power of reparation.

From the form, and deep position of the bones of the spine, as well as from the peculiar manner by which they are articulated with each other, they are, comparatively with other bones, but little liable to fracture; and when it does occur, the nature of the accident is sometimes very difficult to discover, if the spinal marrow has not suffered either compression or laceration. The mode, however, to be adopted, to discover the extent of injury to the bones of the spine, is, to place the patient in the prone posture, and then trace the whole length of the spine along the spinous processes; by which means, the slightest irregularity, or unnatural motion of any part, may be ascertained. If such be found to be the case, and without any concomitant injury to the spinal marrow, the patient should be kept in the most perfect state of rest, upon a strict antiphlogistic regimen, and with the adoption of all such means as appear most likely to prevent any inflammatory action attacking the spinal marrow, and its membranes. Most frequently, however, under these accidents, the displacement of the bones of the spine, is at once indicated by the following train of severe symptoms. More or less perfect paralysis of all the parts below the injured spine; difficulty of breathing, urgent in proportion as the injury to the spinal marrow is near to the brain; a tympanitic state of the abdomen, with a partial erection of the penis. The fæces are passed involuntarily, and the urine is retained. Another symptom, which I have always remarked in these cases, is, a peculiar suffused countenance, like a person recovering from asphyxia. These diagnostic marks, at once indicate the nature of the accident; and by their severity, may the seat of injury be pretty accurately conjectured. For instance, if the fracture be of the two lower cervical vertebræ, the respiration would then be carried on only by the diaphragm, and the patient cannot be expected to

live, at the furthest, more than a week. By the motion of the intercostal muscles, the surgeon may judge which of the dorsal vertebræ is displaced, and the prognosis would be favourable, as far as refers to the period of dissolution, as the injury be distant from the brain. In fracture of the lumbar vertebræ, respiration is but little affected, unless a full inspiration be made, when the power of expiration will be found diminished, and not equal to that of inhalation; all the other symptoms are, however, present. The involuntary discharge of the fæces is explained by the paralysis of the sphincter muscle of the anus, while the peristaltic motion of the intestines is continued; the action of the former being suspended from the injury to the lumbo-sacral plexes of nerves, while the motion of the intestines is preserved with the integrity of the sympathetic system. There are, I believe, no cases in record of recovery from these symptoms, and the period of the patient's existence is depending upon the proximity, or distance of the injury to the spinal marrow, from the brain. I think, if the displacement of the vertebræ happens in the cervical region, the cause of death is sufficiently obvious from the imperfect state of respiration, and consequent want of decarbonization of the blood; but when the injury happens much lower down, and the most urgent symptom is paralysis, then the cause is not so obvious; and the patient seems to die, rather from irritative fever, produced by sloughing of the nates, from unnatural secretions from the mucous membranes of the bowels and bladder, from colliquative diarrhœa, and exhaustion, rather than from any immediate mortal effect, produced by the lesion of the spinal marrow.

The treatment in these accidents should be regulated by the history of each case; for the symptoms, as in injuries of the brain from fracture of the bones of the skull, may either depend upon concussion, or compression, and the compression either upon the depression of bone, effusion of blood, serum, or pus. If, after minute examination, no displacement of bone can be discovered, and the patient is described to have lost all power of motion below the injured part immediately

upon the infliction of the injury, it is right for the surgeon to enquire as to the kind of force which produced the accident, that he may himself judge, as to the probability of such force producing the effects, either by concussion, or lesion. It might also be ascertained that the symptoms did not come on immediately, but subsequently, indicating that it was effusion, rather than depression of bone, which was the cause of the symptoms. Such considerations I say, should regulate the surgeon's practice, pointing out, whether or not, he is to depend upon constitutional, or local means.

I shall first speak of the treatment of such cases where there is evidence of depression of bone,—in which it has been recommended, (and indeed practiced by the late Mr. Henry Cline, and Mr. Tyrrell at present a surgeon of St. Thomas's Hospital,) to elevate the portion of depressed bone by the use of the trephine, or lever. I believe there are cases which may warrant the performance of this operation, although at the same time, I believe there are but few cases in which success is to be expected; but as the patient must inevitably die if compression of bone is the cause of the symptoms; and at the same time if without lesion, the removal of this compression might save life; in such cases, it is to be recommended; particularly when the depression and displacement does not seem so great as to lead to the suspicion, that the spinal marrow must be crushed,—a state which would be indicated by the degree of paralysis. Neither is the operation very painful, the sensation, as well as the motion usually being destroyed below the injury, the surgeon may so manage his incision as not to extend it into the sensible parts, but to a very slight extent. Upon the depressed bone being exposed, it may be raised by the use of the elevator, perhaps assisted by Hey's saw, better than by any trephine, which would require so much more room, and consequently greater removal of soft parts. Any attempt at setting such fractures, by the application of an extending power, is to be deprecated as being much more likely to tear through the spinal marrow, than to replace the broken vertebræ.

In almost all cases therefore, general treatment alone can be had recourse to; means may be necessarily employed to moderate the tendency to inflammation of the parts affected, either by the use of leeches, or cupping. A catheter should be passed into the bladder three times a day, to draw off the water; this is better than to leave the catheter constantly in the bladder, which is liable to irritate the mucous membrane, although no pain is experienced to warn you of the injury. Great attention should be paid to the state of the bowels, which may be relieved at first by purgative clysters, and afterwards by occasional small doses of castor oil, if there be any continued tendency to constipation. The tympanitic state of the abdomen may in some measure be relieved by rubbing it with the compound camphor liniment. But of all considerations, the most essential is, the position of the patient, in consequence of the great tendency of the skin, from its loss of nervous influence, to slough upon pressure of the body; this most frequently occurs in the region of the sacrum. In no case can I conceive the hydrostatic bed of so much use as in injuries to the spinal marrow. If the surgeon believes that the compression depends upon effusion, he would add to the constitutional means, the use of mercury and antimony to increase the action of the absorbents; a blister can scarcely in any case be recommended, in consequence of the danger of a sloughing of the part, being induced. Such are the principles which should regulate the surgeon's management of injuries to the vertebræ, and I have only to relate such cases as have fallen under my care at Guy's Hospital, and to shew, I fear, how little we have to hope for the reparation of the parts.

CASE.

John Sayer, aged 30, Shipwright, was admitted into Guy's Hospital, on the 13th of November, 1832, with all the symptoms of fractured spine, having fallen from a wharf, a height of twenty feet, upon the shore directly on his occiput. On his admittance into Guy's about half an hour after the accident, at half-past 10, A. M., he was the subject of paraplegia, the loss of sensation of the right inferior half of the abdomen, and a complete state of priapism; his pulse were very feeble, and his

countenance much suffused, his abdomen was tympanitic, his breathing difficult, and he complained of a sensation of chilliness and pains in the arms and neck, especially of the right wrist, which was considerably swollen; he had made water just before the accident.

He was ordered to be covered up warmly, to have bottles of hot water to his feet, and to take the julep ammoniæ every five or ten minutes, until reaction had come on.

At 12. mid-day, the pulse remained unaltered and the countenance equally suffused, the state of priapism somewhat less, and sensation of the right side of the abdomen had in some degree returned. About half-a-pint of urine was now drawn off, which was quite natural both in appearance and smell.

At 4 P. M. Remains much the same, has taken some barley water.

At 11 P. M. The pulse were fuller and quick, he was restless, and complained of a feeling of faintness, the countenance remained much the same: his water was again drawn off, which was quite natural, and he was ordered thirty drops of the tinct: opii: in an ounce and a half of camphor mixture.

Wednesday Morning, 14th November.—Remains much in the same state, dozes occasionally, but has had but little sleep. Pulse not so full, rather more suffusion of the face, attended with watering of the eyes. A pint of urine was drawn off, but he has had no motion since the accident. Castor oil enema was ordered, which not operating, at half-past three in the afternoon he was ordered a colocynth enema, this produced the desired effect, the contents of the bowels passing away involuntarily; had three or four motions between three o'clock in the afternoon, and eleven at night, at which time his pulse was about 100. Complains of some nausea, for which he was ordered twenty-five drops of laudanum, in an ounce and a half of camphor mixture, which succeeded in allaying his sickness.

15th.—Pulse 100, and fuller, less distress of countenance, although still much suffused, the watering of the eyes has ceased; breathing apparently performed with less difficulty, although entirely by the diaphragm; the tongue covered with a light-brown dry film; had incessant nausea, with occasional vomiting through the night; bowels frequently open, the contents passing away involuntarily.

10, A. M. Sickness better, kept some coffee on his stomach; complains of great thirst, belly tympanitic; urine which has been drawn off, has a strong ammoniacal smell; symptoms remained the same all the day, except that his sickness returned in the afternoon; ordered brandy and soda water, which remained on his stomach.

At 12, mid-night his urine was drawn off, which was highly ammoniacal. An opiate draught was given him.

16th.—Pulse 92, more compressible; tongue covered with dark-brown fur resembling calomel decomposed by a weak solution of lime; has had but little rest; kept the mixture on his stomach for an hour after he had taken it, but rejected every thing else; other symptoms the same. A pint and a half of urine drawn off highly ammoniacal.

Half-past 6, P. M. Pulse the same; face bedewed with perspiration; the vomiting in some degree debated; has kept broth, and the brandy and soda water in a state of effervescence, with lemon juice, on his stomach; bowels not been relieved since last night, excepting passing about a dessert spoonful of white mucous, something like the white of an egg; a common enema was ordered.

10, P.M. The clyster has operated two or three times; pulse 96, and more compressible; breathing oppressed and hurried; is much troubled with expulsion of wind per anum. All the other symptoms remain the same; the perspiration in the face lessened; three ounces of water were drawn off, which was as in the morning, very ammoniacal; was ordered tinct: opii: gtts. xxx, h. s.

Saturday, 17th.—11, A.M. Pulse 92, small and compressible; abdomen still tympanitic; has had some sleep, and no recurrence of vomiting; does not complain of thirst; the bowels not been relieved; has some feeling in his thighs, but not in his legs. A pint and a half of urine was drawn off mixed with a considerable quantity of blood and mucus.

Half-past 9, P. M. Remains the same as in the morning; was ordered a clyster, which operated almost immediately; half-a-pint of urine was drawn off, mixed with blood and mucus, and smelling powerfully of ammonia, some quantity has passed from him involuntarily during the day; has kept nourishment on his stomach; was ordered to repeat the anodyne at night.

Sunday, 18th.—11 A. M. Has passed a tolerable night; pulse 75, and compressible; contents of the bowels have been twice passed involuntarily, as has the urine; a pint, however, was drawn off by the catheter this morning, with somewhat less blood in it. Abdomen still tympanitic; countenance more depressed and anxious; has taken in the last two days, arrow root and milk which has been retained. This morning I noticed that his urine passed from him in small quantities with each effort of expiration.

10, P. M. Is much the same; his urine was drawn off; the bowels have been twice relieved; ordered tinct: opii: ℥ss. h. s.

Monday, 19th.—11, A. M. Seems weaker; urine passing at intervals involuntarily, less tinged with blood, a pint of which was drawn off by the catheter; priapism still remaining, but not always to the same degree.

6, P. M. Sinking gradually; could draw off no water.

Tuesday, 20th.—11, A. M. Has had a very restless night. A clyster which had been given last night had operated two or three times; urine continues to pass at intervals involuntarily; has vomited occasionally since six this morning. Pulse 85, but scarcely perceptible; abdomen very tympanitic, with disposition to priapism; drew off half-a-pint of urine, which had not so ammoniacal a smell, but was highly alkaline, as proved by the test paper.

10, P. M. Bowels been relieved; stertorous breathing has come on; abdomen excessively tympanitic; pulse imperceptible; to continue the tincture of opium at bed-time.

Wednesday, 21st.—Sinking fast: pupils insensible. Expired at 12 mid-day.

Post Mortem Examination.—On raising the skin there was a remarkable absence of adipose membrane, and the muscles were particularly firm and dry; two of the lower ribs on either side were found to be united, so as to form a bifid termination. The left lung was free from pleuritic adhesions, rather engorged, and somewhat emphysematous, indicated by a rounded and puffed margin; the right lung had some slight adhesions at the apex, and its substance was rather too firm for a state of health; the heart was natural, but rather more fluid in the pericardium than is usually found, and the membrane itself somewhat tinged with a rose colour tint, arising from the turgescence of its vessels. On opening the abdomen the intestines were very much distended with flatus, but presenting no other morbid appearance, than in one or two places a small flake of puriform secretion on their peritoneal covering. The bladder was distended, and its posterior part was adherent to the parts in contact with it by bands that assumed a considerable degree of organization, and in laying it open, the mucous membrane was found thickened, discoloured and ecchymosed in patches, with flakes of lymph scattered all over its surface; this state was probably the effect of the frequent use of the catheter, the introduction of which had latterly been attended with some difficulty. The urine found in the bladder was tinged with blood, and highly ammoniacal; the ureters were healthy, as were the spleen, the pancreas, and the liver. On turning the body to expose the back for the purpose of examining the vertebræ, no mark of external injury was visible. The whole spinal cord was removed, and found healthy, excepting opposite the sixth cervical vertebra, where its substance was broken down and very discoloured. It is proper to notice that although the medullary substance of the spinal marrow was perfectly healthy, excepting at the very seat of the injury, that there was a considerable turgescence of the vessels of the dura matral sheath throughout. On a careful examination, the sixth cervical vertebra was found split longitudinally, and so separated as to project backwards

over the seventh. The posterior ligament proper to the bodies of the vertebræ was slightly torn.

The diagnostic marks of the nature of this accident were so clear, that it was impossible to mistake the cause of the symptoms, as arising from compression of the spinal marrow; and immediately I saw the patient, without examining the spine, I prognosticated that it was the sixth or seventh cervical vertebra that was injured, and this I was led to believe from observing that all the intercostal muscles were paralysed, respiration only being carried on by the diaphragm, the action of which was perfect, and this could not have been the case, if either of the dorsal veretbræ had been fractured, or the cervical above the sixth.

Several such accidents as these have occurred at Guy's Hospital, under my care, the history of each I might detail, but as the symptoms are in all so similar, it would be little more than a recapitulation of facts.

Many of the symptoms concomitant with injury of the spine are difficult to comprehend,—such for instance as the tympanitic state of the abdomen, and the tendency to priapism; the rationale of which does not appear to be understood, but is attributed to the disturbance of the simultaneous influence of the spinal and sympathetic nerves. The incontinence of the fæces, and the retention of urine, arise from causes sufficiently obvious; the difficulty in acting upon the bowels, in most cases, depends upon their state of constipation before the accident, and their obstinacy is explained by the consequent torpidity, from injury to their nervous system. The involuntary discharge of urine which occurred in this case, and which usually does happen in the latter stages of this affection, seems to depend upon the loss of elasticity of the urethra, partly attributable to the frequent introduction of the catheter. With respect to the suffusion of the countenance, it is a symptom which I have always noticed attending injury or disease to the spinal marrow. I do not remember to have seen this symptom mentioned as a diag-

nostic mark of injury to the medulla spinalis, but it is one upon which I always rely; indicative of the imperfect decarbonization of the blood, depending upon the inability of the muscles of respiration to perform their natural functions. The appearance of the bladder, both as to its external adhesions and internal abrasions, depended upon the mechanical effects of the frequent introduction of the catheter.

The following case is somewhat singular, from there being no fracture of the bones of the spine, but a laceration of the intervertebral substance, admitting of such a displacement of the vertebræ as to press upon the spinal marrow; producing, therefore, precisely the same symptoms, and leading completely to the same practice, as if fracture had occurred; thus rendering it quite unnecessary to describe this case under a separate head.

CASE.

Joseph York, a stout man, aged 45, was admitted on Monday, April 8th, 1833, at half-past 9, P. M., with injury to the spine, occasioned by a barrow full of grains falling a height of fourteen feet upon his neck and head, producing three severe lacerations of the scalp, and an immediate loss of all sensation and motion of his lower extremities. He was directly brought to Guy's Hospital, which was in the vicinity, the accident having happened at Barclay's Brewhouse; and on admission, the symptoms were as follow:—

Paralysis of all the intercostal, as well as the abdominal muscles, so that respiration was carried on completely by the diaphragm. He had partial priapism, tympanitic abdomen; complained of general sensation of coldness, although the surface was naturally warm. His pulse were only 56, and labouring. There were three lacerated wounds on the scalp, one of which was sufficiently deep to divide the bone; but as he was perfectly sensible, there was sufficient evidence that the symptoms did not arise from injury to the brain; he was therefore placed in the prone position to examine the spinal column, when it was found that on pressure over the sixth and seventh cervical vertebræ, there was some motion of these bones, that pain was felt extending upwards, and was increased by pressure.

The head was ordered to be shorn, and the wounds dressed: as there was considerable injury of the soft parts about the injured spine, a cupping glass was applied on either side, and about four ounces of blood withdrawn.

His water was drawn off with a catheter, and was found to be very acid, as proved by reddening litmus. The julep ammon: was desired to be given at intervals.

9th.—8, A. M. Has had no sleep during the night; complains of some pain and difficulty of motion in his arms, although he describes himself altogether as feeling better; has neither voided urine or fæces since his admittance; his respiration is quick and difficult. Pulse 72, increased in power and less labouring; his urine was drawn off, and was still found acid. The priapism still remains. Ordered common enema stat.

2, P. M. Continues much in the same state; the enema has not acted; ordered to be repeated; still complains of sensation of coldness.

9, P. M. It has been necessary to administer a third enema, which at present has not had the desired effect; he is now much worse in every respect; the breathing quick, short, and irregular. The abdomen was more tympanitic; his urine was again drawn off, is still acid.

10th.—On this morning's report, it was found his bowels had been freely opened, of which he was perfectly unconscious. His breathing slower, but more difficult; the pulse full and soft. The surface of the body was now cold, and clammy to the touch; his countenance anxious, although he retained completely all his powers of mind, and seemed fully conscious of his approaching dissolution.

At 12, M. An evident change had taken place since last report, and from this time he gradually sunk, and died at 3, P. M.

About twenty hours after death the body was examined, and on exposing the cervical vertebræ a complete laceration of the intervertebral substance between the fifth and sixth was discovered, and without any fracture; the capsular ligament of the articulation between the two vertebræ on the left side was torn through.

On removing several of the vertebræ with the spinal marrow, and then examining the spinal cord, a slight blush of inflammation was found on the inner surface of the dura mater, but no laceration or lesion of the medulla spinalis.

From this post mortem examination, there may appear some difficulty in comprehending the immediate cause of these symptoms, and the rapid dissolution, when there was no apparent disorganization of the spinal marrow; this, however, only proves how slight a degree of pressure will destroy the function of the nervous system, and perhaps too, lead us to consider how little hope of a happy result can arise from any surgical operation, when such slight apparent causes can produce such violent effects.

Fractures of the Ribs.

From the description of the accidents to which the flat bones, and bones of the spine are liable, I shall proceed to those of the ribs, which, although if only geometrically considered, must be classed as long bones, yet in a physiological point of view, they collectively perform the office of flat bones, in forming cavities for important organs, and are also peculiar from the extent to which they assist in the function of those organs.

In the description of fractures of the ribs, we must take a general view of the injuries to which the thorax is liable, so that the surgeon may be enabled methodically to examine, and judiciously treat his patient, according to the nature of the accident.

All writers on surgery have divided the injuries of the thorax, into distinct heads:—*First*, Where the parietes are only contused. *Secondly*, Where they are lacerated. *Thirdly*, Where the serous cavity is opened. *Fourthly*, Where the viscera are wounded. *Fifthly*, Where the viscera are protruding; and *Sixthly*, Where the viscera are lacerated without any wound of the parietes.

In fractures of the ribs, all the above-mentioned circumstances, (the first excepted) may occur; but there is little liability to the protrusion of the viscera of the thorax, in consequence of its firm bony parietes, which forms one of the great distinctions between wounds of the thoracic and abdominal cavities, in the latter of which, protrusion is almost certain to occur. When the serous cavity is opened, the great danger arises from the tendency to pleuritis, which is only to be prevented and overcome by extensive depletion. When the viscera are wounded, the danger accrues from three sources; *first*, from the effusion of air producing emphysema; *secondly*, from the great tendency to the effusion of blood; and *thirdly*, from the consequent disturbance to the important function of respiration.

When called upon to examine a patient, whom you have

reason to believe from the nature of his accident, is the subject of fractured ribs, you would endeavour to learn whether or not the viscera contained within the chest had sustained any injury, and your diagnosis would be formed, by the moderation or urgency of the symptoms. Having ascertained, or at least having reason to believe, that the interior of the thorax is uninjured, indicated by the absence of any difficulty of breathing, beyond the motion of the fractured bones; the treatment is evident, namely that a broad bandage should be wound around the chest to produce coaptation of the fractured ribs; and by its being tightly applied, to prevent their elevation, they are maintained in their proper situation. After fracture, the ribs are found very quickly to unite, which in fact is the case with all bones that were originally early formed; besides these local means, the patient should be constitutionally treated by bleeding, purging, small doses of tartarized antimony, to diminish the action of the heart, with low diet and perfect rest; which will usually be found means sufficient to secure the patient from subsequent ill effects.

In the second class of injury, in which the fracture is made compound by laceration of the soft parts, if there be no internal injury to the chest, the same treatment as I have just described, should be employed; but if the intercostal artery should have been torn through, it will be necessary to secure it, as also any other vessel whose magnitude is sufficient to make the loss of blood a consideration to the patient. This may generally be done, in such cases, by enlarging the lacerated wound.

When the third class of injury has occurred from a fractured portion of rib, wounding the pleura, and opening the serous cavity, it almost invariably occurs that the lungs must also be torn, and this will be readily believed, when for one moment we consider the constant adaptation of the lungs to the size of the chest; so that these two classes may be properly considered together, and are indicated by air, with more or less blood, rushing from the wound.

Should it occur, however, that the lung does not appear to have been wounded, every attempt is to be made to unite the wound through the parietes, by the adhesive inflammation; employing strictly at the same time, the antiphlogistic regimen, to prevent the occurrence of pleuritis. When the lungs are wounded, as I have said must generally occur in these cases, the treatment depends upon the quantity of blood which flows, and the extent of difficulty of respiration. If the flow of blood be so great, and there be any difficulty in its escape from the chest, so as to lead to the dread of collapse of the lung from its pressure, it is then, not only wrong to close the external wound, but it should be enlarged, so as to admit of the free exit of the blood; which may be further assisted by placing the patient in the best position to facilitate its flow from the chest. Besides this, a considerable quantity of blood must be drawn from the arm, by a large opening, even to syncope, as the only means to be relied upon to check the continuation of bleeding from a wounded lung. Perfect rest, cool temperature, acidulated drinks, and every means on the one hand of diminishing the action of the heart, and on the other of maintaining the secretions, are to be employed; and as soon as there is the slightest appearance of reaction, indicated by pain, difficulty of breathing, and perhaps by some return of bleeding from the wound, the lancet must again be called in aid, as the only hope, dangerous as its use may appear, to save your patient, and thus allowing time for the healing of the wounded lung.

Surgeons have recommended, that if such accidents have occurred from a gun-shot wound, or from any cause by which it is probable that any extraneous substance may have entered the chest, that advantage should be taken of the syncope produced by the copious bleedings, to search for, and remove those extraneous bodies; but I should recommend great precaution in the indulgence of this prerogative, for there is every reason to dread the inflammation of the pleura, as likely to follow officious interference in wounds of the chest. If, however, extraneous bodies are so near the

surface as to admit of ready abstraction, they should certainly be withdrawn.

Some care will yet be required, after these necessary active means have been employed, in the restoration of the patient's constitutional powers; for which, however, no general plan can be laid down, but must be left to the judgment, to be exercised according to the peculiarities of each individual case.

The fifth class of injury, which alludes to the protrusion of a viscus from the chest, is an accident of but rare occurrence, depending upon the solidity of the cavity itself; although it is described that the lung is sometimes protruded, and even wounded also at the same time. I cannot, however, understand how this accident is to occur; for when wounded, it would not then be sufficiently distended to fill the chest, and much less to protrude. Should, however, such a protrusion occur, by gentle compression it should be returned into its natural cavity, and by compress and bandage, may be retained there. Accidents to the chest, when the lungs are wounded, either with or without laceration of the parietes, are attended with an escape of air into the cellular membrane, forming a disease which is termed Emphysema. This is, however, a symptom which rarely occurs, although frequently spoken of; when it does happen, it puts on a most frightful appearance, although it is not usually so alarming a feature, as the perfect disfiguration it produces is likely to impress. The treatment in these cases is, to make free incisions through the skin, to allow of the escape of the air; and bandages should be applied through the whole extent of the distended parts, as well as over the ribs, to prevent perfect respiration. If compresses are employed, they should not be applied opposite to the precise spot where the wound in the lung has been inflicted, for fear of forcing a fractured rib still deeper into the lung. It has been recommended by older surgeons, in cases of emphysema, to attempt by mechanical means to withdraw the collected air from the chest; but this practice is to be condemned as worse than useless.

Should Empyema follow the effects of wound, although it is much more frequently an idiopathic disease, the operation of paracentesis thoracis may be necessary; if so, the puncture to evacuate the pus, should be made below the original wound; as adhesions are very likely to have formed at that point. What is most to be dreaded after all these violent injuries to the thorax, is, the liability to phthisis. With these views, I trust, I have furnished sufficient general principles to lead to their application in every case that may occur; and, although to a student there may appear more to think of at the bed-side, than can sufficiently rapidly occur, he will soon find by that practice which every Hospital affords, that when once he understands the principles, their application in each case arises as quickly as they can be required.

The following case is one of comminuted fracture of the left clavicle; fracture of nine ribs, and emphysema, without any laceration of the parietes.

CASE.

Susanna Webster, aged 76, of slim form, and general delicate appearance, was admitted into Guy's Hospital, at 5 P. M., December 24th, 1832. She described that she had been thrown down by a carriage which had passed over her chest.

Upon examination, there was found a very comminuted fracture of the left clavicle, and fracture of several of the ribs on the same side, indicating laceration of the lung, by the appearance of an extensive emphysematous swelling. By placing the ear upon the left side of the chest, blood and air could be distinctly heard rushing from the lung. There was also a severe wound and contusion of the scalp, but no fracture of the bones of the skull could be detected. The respiration was very laborious; the pulse quick, small, and feeble; the extremities and surface of the body cold; the pupils perfectly sensible. A flannel was gently bound over the ribs and clavicle, and the wound in the head dressed; she was ordered the julep ammon: every four hours, and bottles of hot water to the feet. Her state of collapse was so great, that no attempts were made to relieve the emphysema by incisions through the skin.

Half-past 6, P. M.—Pulse 95, small, and rather irritable; respiration very laborious; five drops of tinct: opii were ordered to be added to each dose of the julep ammoniæ.

10, P. M.—Pulse still very quick and small; respiration irregular, quick, and laborious; emphysema extending; countenance anxious. Has not passed any urine since the accident.

25th.—8, A. M. Pulse much the same; respiration rather less laborious. Not having passed any urine, it was drawn off by the catheter; the bowels not opened since her admittance, but says they were relieved yesterday morning. Complains of general sensation of coldness over her body.

12, M.—Is getting worse every minute; pulse becoming weaker and weaker; and the respiration at the lower part of the left lung has entirely ceased. The abdomen somewhat distended, and as the bowels were still confined, a castor oil enema was ordered.

8, A. M.—Bowels opened freely; pulse rapid and small; her respiration seems as if it were less laborious, from her want of power; it is now wanting in the left lung, excepting at its most superior part. She is scarcely able to speak, although perfectly sensible.

10, P. M.—Pulse scarcely to be felt; respiration feeble; she appears as if gradually sinking, although still perfectly sensible. She lingered, however, until half-past six, A. M., 26th, when she expired.

Upon examination of the body twenty-eight hours after death: on separating the integuments, considerable ecchymosis was found over the centre of the sternum, and on the ribs on the left side. The sternum was fractured at the upper part of its middle bone; the clavicle was also fractured in its centre, and much comminuted. The nine upper ribs were broken at their bodies; the fifth piercing the pleura, and lacerating the lung in two or three places; the sixth and seventh ribs were broken at their necks, and had pierced the pleura, which was found excessively inflamed, and within its cavity six ounces of blood which had been extravasated from the ruptured lung; the abdominal viscera were perfectly sound.

With so extensive an injury, no hopes could be entertained of recovery; but yet it may appear to some, after the principles which have been laid down for the treatment of bleeding from the lungs, and for emphysema, whether or not the lancet might have been used in this case to check the bleeding from the lung, or openings made in the inflated skin for the escape of the effused air;—the answer here would be, that with the general symptoms of collapse that presented themselves, the possibility of employing any active means for relief were entirely precluded; for the heart would probably

have ceased to beat, if the slightest syncope had occurred. In gun-shot wounds, where there is an external wound, admitting of the escape of the blood, there is a better indication of the propriety of the lancet by the demonstration of the quantity of blood which flows, which if so copious as in itself to produce syncope, it works its own remedy; but, on the contrary, if the respiration becomes more and more laborious, as if blood was escaping into the chest, and pressing upon the lung, then the only means of checking it would be by bleeding from the arm to syncope, unless, as in this case, the degree of collapse forbids it.

CASE.

James Vartey, aged 56, a coal porter, was admitted into the accident ward, on March 25th, in consequence of the effects of a fall over a coal box while in a state of intoxication. He complained of great difficulty and pain in respiration, which was short and quick; his face was livid; his pulse quick and feeble; and his extremities were cold. Upon examination of his chest, for from these symptoms it was there the injury was indicated, three ribs were found fractured on the left side, between the eighth and eleventh. He was immediately put to bed; warm bottles applied to his feet, and warm tea given him to drink. In about two hours reaction came on, a flannel bandage was then tightly applied round the chest, and as he had entirely recovered from his previous state of depression, complaining also of pain in the seat of fracture, he was bled to the amount of thirty ounces.

16th.—Still complains of pain in the chest, particularly on the left side, but says he slept soundly during the night; describes that he has twice fractured his ribs upon the same side, before. Pulse nearly natural; bowels have not been opened since his admission, was ordered cal: gr. v., ext: coloc: com: gr. x., M. stat. sumend.

17th.—Bowels freely opened; complains of cough, with distressing efforts to expectorate a tough viscid mucous; has otherwise much less pain in the chest, was ordered the magnesia mixture with the oxymel of squills.

18th.—Is better in every respect, but was still ordered to adhere strictly to the antiphlogistic regimen; wetted pasteboard was applied underneath the bandage. From this time he gradually recovered his strength, and as gradually was allowed to partake of more generous diet, until April 14th, when he was discharged convalescent.

This case points out well the propriety of waiting for reaction before any active means be employed, and of assisting nature's efforts for restoration by warmth, and even sometimes stimulus; and in my opinion it equally well shews the propriety of copious blood letting, so soon as loss of blood shall be indicated.

CASE.

Patrick Callagan, aged 34, Bricklayer, whilst at work was thrown from a scaffolding, and pitching on his left side was so much injured as to be admitted into Guy's Hospital, on May 15th. Upon examination, the sixth and seventh ribs were found fractured on the left side; his pulse were feeble, the surface of the body cold, and his countenance pourtraying collapse; he was put to bed, and warm water ordered to his feet. In seven hours sufficient reaction occurred to indicate the necessity of the abstraction of blood, which was done to produce the sensation of faintness; active purgatives were administered; soap plaster and bandage applied round the chest, and low diet persisted in; which means proved of sufficient benefit to allow of his leaving the Hospital free from any danger in ten days.

The case which I am about to relate, is one, where there was severe and fatal injury to the chest without fracture of the ribs, but still will properly come under our present consideration, although unattended with any fracture of the bones of the chest.

CASE.

William Morgan, aged 18, a sailor, was admitted into Guy's Hospital, October 19th, 1831, about half-past 4 P. M., in consequence of an injury he had sustained by a fall from the mast-head of a vessel upon a belaying pin, which is attached to the side of a vessel. The peg had entered his chest just above the clavicle, and having penetrated upwards of seven inches, had suddenly broken off, and he was precipitated overboard into the Thames. He was immediately picked up, and conveyed to Mr. Randall, a surgeon, at Rotherhithe, who extracted the peg, which required the application of great force, and was followed by considerable hæmorrhage; he was then taken to Guy's Hospital. Upon his admission, he complained of great pain in his left shoulder, and an uneasy sensation in his abdomen. There was considerable tumefaction of the left side of the face and eye-lids, with ecchymosis. A large lacerated opening immediately above the clavicle, about four fingers in

breadth, presented itself, through which the clavicle might be felt fractured into two or three portions, and the subclavian artery was perfectly laid bare, as it passed over the first rib. There was emphysema extending from the neck, down the side and back; the surface of the body and feet cold; the abdomen somewhat distended, and he had partial priapism. The pulse 140, small, and sharp; he was ordered to be kept perfectly quiet. The edges of the wound were brought together by straps of adhesive plaster, and a dossil of lint applied to absorb the oozing blood; he was ordered to take the julep ammon: with the hopes of producing reaction.

8, P. M.—The pulse was rather fuller and jerking, but, although thus increased in power, they were diminished in number, being only 120. He complained also of an increased pain in the abdomen. Venæsectio ad ℥xviij, and a catheter to be passed, which drew off a quart of apparently healthy urine.

10, P. M.—The pulse had again risen to 130, but they were small, and indicating want of power.

℞ Tinct: Opii gt. xxv.
Mist: Camph: ℥iss. M. stat: sumend. Foveatur abdomen.

20th.—2, A. M. Pulse 140, weak and fluttering; respiration labouring; surface of the body cold.

7, A. M.—Pulse 140, and weaker than at last report; emphysema somewhat increasing, and air escaping from the wound; breathing becoming more and more difficult.

11, A. M.—Much the same, as to the previous symptoms, but, in addition to them, an obstinate and constant sickness has come on; the bowels have not been open since the accident; a common enema was therefore immediately ordered, and saline medicine with ten drops of tinct: opii to be taken at intervals. From this time he gradually sunk, and died about five P. M., the enema having taken no effect.

On examination after death, it was found that the wound produced by the penetration of the peg, extended from immediately above the left clavicle into the axilla; the clavicle itself was fractured in two places, and the subclavian artery, or more anatomically speaking, the axillary, was found lacerated; a large opening was found passing from the axilla, into the chest between the third and fourth ribs, leading into the left lung; and a large piece of blue cloth was firmly fixed into the lung itself, forming a plug which probably prevented immediate death from hæmorrhage. This wound was found to extend to the diaphragm, which presented a very ecchymosed surface; the spleen was found lacerated on its inner and posterior surface. The stomach and intestines were filled with air.

When it was found that the axillary artery had been lacerated, it led to a discussion how it should happen that equal pulsation could be felt in both radial arteries:—this led to a more minute examination, when it was found that immediately after the subclavian had passed the anterior edge of the first rib, there was a division into a radial and ulna branch, the latter of which had been lacerated; thus accounting for the pulsation being felt in each arm on the radial side.

There were no incisions made in this case, to admit of the escape of air, as the emphysema was kept under by the wound produced by the accident, rendering the case very similar to one in which the wound is inflicted by a cutting instrument; under which circumstance air seldom escapes into the surrounding cellular membrane. The great peculiarity of this case is the small quantity of blood which was lost, compared to the size of the vessel which was lacerated, which may be accounted for, partly from the peculiarly lacerated manner in which the vessel was torn through, and partly perhaps from the pressure of the extraneous substance which was driven into the wound. The distension of the abdomen and the partial priapism would lead to the belief that some injury had been done to the spinal marrow, which was not however examined; at any rate, it could but have been slight, as he had perfect voluntary command of his excretions.

I might extend the history of cases of fractured ribs, but I think I have already described a sufficient number to point out the mode of practice which is to be adopted. I may, however, remark, that when fracture of the ribs is indicated by an acute pain in respiration, the treatment consists in passing a broad girth with a buckle and strap tightly around the chest, so as to keep the ribs stationary during respiration. The surgeon, however, should first examine whether the salient angle, produced by the fractured extremities of the ribs, be directed outwards, or inwards towards the lungs; if outwards, a compress of wetted linen should be applied over the part fractured, but if inwards, two compresses should be adjusted at a distance from the fractured part, and in

such a situation as may tend to press the displaced portions outwards from the cavity. When the ribs are fractured on both sides of the chest and opposite to each other, a bandage ought never to be applied, as it would press the fractured ribs upon the lungs: in such cases, bleeding, and the strictest antiphlogistic regimen is to be trusted to.

Fracture of the Sternum.

When the sternum is broken, and without any complication of accident, no other treatment is required than the application of bandages, compresses, strict antiphlogistic regimen, and, indeed, all the means that have been already recommended for fractures of the ribs. Some little difference, however, is to be observed with respect to the position of the patient; for in these cases the head should be bent forwards, and the pelvis raised, to relax the muscles which would otherwise tend to move the fractured bone.

CASE.

Fracture of the Sternum.

Thomas Carter, aged 23, was admitted into Guy's Hospital, October 17th, 1832, with displacement of the upper part of the second piece of the sternum, which was driven backwards behind the upper portion, from the effects of a blow. Immediately after the accident he suffered from dyspnœa, and experienced considerable pain on drawing a full inspiration. Upon examination, the extent of injury was quite obvious, but no means which could be employed could bring forward the depressed portion of the bone; the object therefore was, by constitutional means, to prevent inflammatory action, and by the mechanical adaptation of a bandage rolled around the chest, as in fractures of the ribs, to prevent the motion of the displaced bone; bleeding, purging, and the strictest antiphlogistic regimen were adhered to; and upon the application of the bandage, a compress was placed upon the lower part of the sternum, so as to have a tendency to press the displaced portion forwards. These means immediately produced the desired effect, removing all difficulty of breathing; and in a few days after, while in the act of coughing, the depressed portion was forced into its natural place, and the man, from that moment, was convalescent.

This case, perhaps, may properly be considered rather as a

dislocation of the second from the first peice of the sternum, than as a fracture; but as the effects and treatment are precisely the same, it signifies but little which name is given to the accident.

It sometimes happens that inflammation extends into the anterior mediastinum, affecting the absorbent glands, or perhaps, the remains of the thymus gland itself, which may go into a suppurative state; producing dyspnœa from pressure upon the lungs,—disease of the sternum from its tendency to be evacuated externally,—and presenting a pulsating tumour from its contiguity with the heart.

Such a case occurred in the practice of Sir Astley Cooper, in the person of a medical student, who believed himself, and had been led to believe by other medical men, that he was the subject of aneurism; under which conviction he had made up his mind to make a voyage to Bourdeaux, there as he believed to die. Before he left London, however, he thought he would consult Sir Astley Cooper, who told him at once the nature of his complaint, evacuated the matter, which had made its way through the sternum, and removed, simultaneously, both the appearance of aneurism and the fears of the patient.

Fracture of the Short Bones.

So few cases have occurred to me of fracture of the short and mixed bones, that I have nothing of interest to communicate, as the result of my practice in Guy's Hospital upon this subject; and indeed, this might be premised, by considering the physiology of these bones; for in their use, as well as in their accidents and diseases, they must be considered rather collectively than separately, and when fractured, so great a force usually has inflicted the injury, as to render the treatment rather as a constitutional than a mechanical consideration.

I may, however, relate one case of extensive fracture of the bones of the face, in which every bone on one side was broken, attended with great laceration of soft parts.

CASE.

Martha Ambrose, aged 48, was admitted into Guy's Hospital, in March 29th, 1829, for an injury which she had just received from being thrown down by a horse, which had run away with a gig. Upon her admission, a more deplorable object could scarcely be conceived; all the soft parts on the right side of the face were detached from the bones, which were most extensively fractured; the lower jaw was fractured in two places, the superior maxillary and palate bones were broken through their palatine processes, so that the roof of the mouth fell upon the tongue, and a fissure extended through the body of the superior maxillary bone into the antrum, and upwards into the orbit; the malar bone was broken through, so that the zygomatic arch was flattened; the bones of the nose were driven in, and, in fact, it may be said that every bone upon that side of the face was fractured, and many comminuted.

A short time after her admission, a person who had witnessed the accident, brought the integuments which had been detached, so perfect, although thus separated, as still to preserve the perfect likeness of the patient; a drawing of which was immediately taken and the parts preserved in our museum. I ordered the wound to be carefully washed and cleansed from all extraneous substances, and the portions of comminuted bone to be removed; and as my great object was to keep down the tendency to inflammation, I directed that cold water should be kept constantly falling over the face, which was covered with lint, with a view of maintaining an equitable and low degree of temperature, at the same time, by constitutional means, subduing arterial action. The treatment had a most salutary effect, and without a single bad symptom supervening, she got perfectly well; the cure, however, being necessarily protracted from the numerous portions of bone which exfoliated.

Fracture of the Long Bones.

The form of these bones, as well as the function which they are destined to perform, necessarily leads to their frequent solution of continuity, and the diagnostic marks are, in most cases, sufficiently obvious at once to lead to a correct knowledge of the nature of the accidents. There are deformity and shortening of the limb affected; a loss of natural motion of the part; more or less pain and crepitation, on rubbing the fractured parts against each other; inducing at the same time an unnatural mobility. Such signs

collectively would prevent the possibility of overlooking a fracture, but they do not all constantly occur, as in fracture of one of the bones of the fore-arm or leg, in which shortening is scarcely ever a diagnostic mark, for the deformity occurs in the horizontal and not in the vertical direction; but under these circumstances, crepitus and unnatural mobility are sufficient for a just diagnosis.

Having ascertained that a bone is fractured, there are yet many points to be considered to regulate the treatment of the accident upon proper principles: *first*, as to the part of the bone broken; for although it is true that a bone may be broken in any part of its length, yet the treatment, both locally and constitutionally, will depend much upon this consideration, as it will often lead to a distinction of great importance; for instance, a fracture near a joint will point out the necessity of constitutional remedies, to prevent the extension of inflammation and subsequent anchylosis; in the centre of the long bones the fractured portions are more particularly under the influence of muscles, and require therefore peculiar mechanical means to obviate their effects; and again, in particular parts of certain bones a fracture may lead to the necessity of a peculiar position during the progress of reparation. *Secondly*, the surgeon should pay great attention to the direction of a fracture, to ascertain whether it be transverse or oblique; for in the latter case, it will be found that the means employed for coaptation will be more difficult in their application, and require usually a continued extending force to prevent the displacement of the bones by the action of muscles. *Thirdly*, the influence of the muscles upon the broken extremities of the bone, is a subject well worthy the attention of a surgeon; for the direction that is now given to them points out at once the best mechanical means of obviating such derangements, enabling him either by position of the body to relax such muscles, or by the application of splints and compresses, to retain the bones in their natural situation. *Lastly*, in cases of fracture, the surgeon should well examine all the circumstances

attending the accident; not only with respect to the part of the bone broken, the direction of the fracture, or the situation of the extremities of the bone, but also in reference to the state of the soft parts, as whether the fracture be simple or compound, and also the degree of laceration of soft parts, the probable injury of blood-vessels, and the general state of the patient's health; being all circumstances by which alone a just prognosis can be formed, and by which a surgeon is to judge of the propriety, either to attempt to save the limb, or at once to remove by amputation what he fears, otherwise, might prove destructive to life. The object should always be, first, to save life; secondly, the injured limb; and thirdly, by judicious application of remedies, to render that limb, as nearly as possible, capable of performing its natural functions.

I think, from the circumstances I have just detailed, that it must be clear that no general plan can be laid down for the treatment of fracture, particularly as we find that the urgency of the symptoms will vary in degree in almost every case, and therefore it is better for the surgeon to form his plan of treatment upon the examination of each case which may fall under his care, rather than to be tied down by any preconceived notions. Thus I have a great objection to hear one surgeon say, I always place a patient with fractured thigh upon his back; another, that he invariably places the limb in the extended position; and a third, that he always employs the double inclined plane: for each plan, although applicable to particular cases, may be equally injurious to others.

Upon taking a retrospective view of these diagnostic marks and indications of fracture, it is clear that the treatment must depend on obviating the derangement of the fractured bone, by counteracting the influence of the muscles, and by using such constitutional means as shall seem most likely to prevent the ill effects which usually follow such accidents. The first object is termed "setting a fracture," which implies the act of producing coaptation of the fractured

portions of bone, and the mechanical means employed for retaining them in that position. To produce coaptation, force is always necessary to overcome the actions of the muscles, which alone have a tendency to separate the fractured fragments. The application of this force must, in most cases, be applied in different directions, producing what is termed extension and counter-extension; but this is not always necessary, as in instances of fracture of the bones of the fore-arm and leg, where the displaced fragments usually form a salient angle with each other, in which pressure, perhaps, assisted by some little rotatory motion, will be found sufficient to bring the fractured extremities of the bone in apposition.

But all these circumstances, connected with the mechanical means to be employed for the coaptation of fractured bones, must depend upon the portion of the bone broken; the direction of the fracture; the position of the fractured portion; and the concomitant circumstances; therefore, I shall not further attempt to lay down any general plan, but point out, with the history of the cases that I detail, the circumstances which induced me to follow the particular mechanical treatment of each case.

In the description of the cases of fractures of the long bones, that have occurred in my practice at Guy's Hospital, I shall choose such as offer the most practical points for consideration, and shall be guided not so much by their result, as by the opportunity afforded me of dwelling upon the peculiarities of each case. I shall commence with fractures of the neck of the thigh-bone within the capsular ligament, as that subject has already so interested the profession from the different opinions which have been held as to its powers of reparation.

Fracture of the Neck of the Thigh Bone.

In old persons, fracture of the neck of the thigh-bone within the capsular ligament, is an accident of very common occurrence, and is caused usually by some very trivial force,

such as a slip; the toe striking against some fixed point while in the act of progression; or a fall upon the trochanter major.

The frequent occurrence of this accident in old people, does not depend upon their liability to such exciting causes from their infirmity, as might at first be supposed, but from the predisposition of the neck of the thigh-bone to yield to any unusual force, in consequence of absorption going on internally, without a reciprocal deposition on its external surface, to defend it from the effects of this decay. Let any surgeon but examine the thigh-bones of old people, and they will invariably find such a change taking place, to a greater or less degree; and that the angle formed by the junction of the neck of the thigh-bone, with the femur, is altered in proportion to the age of the individual, and with this change is the concomitant liability to fracture. This fact is, in my opinion, established in practice by the result of Sir Astley Cooper's observation, that in two hundred and twenty-five cases, two only occurred before the age of fifty years; and one of those patients was the subject of aneurism of the iliac artery. Hence it is that the age of the patient, and the trivial accidents which cause the injury, form the principal diagnostic marks of fracture of the neck of the thigh-bone within the capsular ligament.

Having spoken of the exciting and predisposing causes, I shall now describe the diagnostic marks of this injury, which I consider so distinct that it is next to an impossibility to form a wrong opinion of the nature of the accident. It will be seen from the previous statement, that the age of the patient at once forms a strong feature in the nature of the accident, especially if upon the application of some very slight force there be the entire loss of the use of one of the lower extremities. Still, however, there are other symptoms which should also be attended to; and for the proper investigation of these, the patient should be placed in bed upon the back, taking care that in this position the anterior and superior spinous processes of the ilia are precisely upon the same

plane, when immediately it will appear that the limb affected is shorter than the other: the degree of shortening, however, depends upon the length of time which has elapsed since the accident, usually being from one to two inches shorter immediately upon the separation of the bone, and becoming three or four inches shorter subsequently, in proportion as the patient has borne upon the injured limb. The foot, and indeed the whole limb is everted, so that the heel upon the injured side is on a plane above the maleolus internus of the opposite limb. At this period the surgeon should hesitate before he determines his diagnosis, as all the symptoms yet detailed may attend a dislocation of the femur upon the pubes; the age of the patient, and the slight force producing the injury, alone being incongruous with that accident; but the grand distinguishing mark is the facility with which the surgeon, can by a slight extending force, bring the limb to the same length as the sound one; while in dislocation the limb is so fixed, that no force, less than that which will reduce the dislocation, can produce the same effect. While the limb is thus extended, the surgeon should desire an assistant to place his hand upon the trochanter major of the injured side; during which period the surgeon should rotate the limb, which immediately will communicate a crepitating feeling to the hand of the assistant. At this moment a further very strong diagnostic mark may be derived, not only to ascertain the fracture of the neck of the thigh-bone, but the part where the solution of continuity has occurred. This is to be ascertained by desiring the assistant to place his other hand upon the trochanter major of the sound side, while the surgeon is simultaneously to rotate both limbs, and the assistant will perceive that the trochanters move in the arc of different circles. On the injured side, it merely rolls as it were on its own axis; while on the healthy side the trochanter describes an arch, which, if completing a circle, would have the neck of the bone as its radius. It is almost impossible for the patient to raise the whole limb from the bed, in consequence of the thigh-bone

having lost its point d'appui in the acetabulum. These are the diagnostic marks of this accident; and being all of them concomitant, there can be no excuse for making any mistake as to its nature.

It has been said that fracture of the neck of the thigh-bone is easily confounded with the dislocation of the femur, but at once the distinguishing mark may be formed by the *mobility* of the limb in fracture, and its *fixed state* in cases of dislocation; and only in dislocation upon the pubes, is there the slightest resemblance, the position and direction of the limb being so perfectly different in the other dislocations.

To speak now of the prognosis is to me a more difficult task, although I must say, I have made up my mind, founded I hope upon experience, as to the want of power in the neck of the thigh-bone, to repair itself by ossific consolidation. In consequence, however, of a publication (and by a hospital surgeon too), which appeared some years ago, differing with Sir Astley Cooper upon this important point, I am anxious again to bring the subject forward, that the profession may judge, after the many years which have elapsed since this controversy occurred, of the weight of the accumulated evidence *of the power, or want of power* of this part of the osseous system to unite by bone. This is, in fact, the point at issue; and although Mr. Earle's publication, so elaborately and systematically impunging Sir Astley Cooper's doctrines, appeared so long since, still I feel, that the following sentence requires to be answered, or the profession may consider Mr. Earle's opinions correct. Mr. Earle says at page 11 in his preface, "When, however, I consider the serious consequences which must result from the diffusion of an erroneous opinion of a man so eminent in his profession, which if suffered to be promulgated without qualification will afford but too convenient a shelter for negligence and ignorance, I do not think myself at liberty to hesitate about taking up the gauntlet." The last phrase inspires me with something like the author's feeling, nor shall I hesitate to ask the profession to judge between this controversy of

opinion, and examine what may be the comparative value between Mr. Earle's theoretical assertions, and Sir Astley Cooper's facts, founded upon his practice and experiments. Mr. Earle speaks of his innumerable opportunities both in his own practice, and in his observations upon the practice of others; but he has not substantiated a single instance of union which can militate against the affirmations of Sir Astley Cooper, who, in his book leads to the establishment of a principle, against which, during a practice of thirty years, he had not met with a solitary exception. I cannot therefore but consider, the arguments of Mr. Earle have afforded the profession no room to regret the impression on this subject, under which Sir Astley Cooper's pupils have gone forth into the world; nor do I conceive it to be likely, that zeal for investigation can be checked, or the public good suffer detriment, from the propagation of opinions, founded upon practice alone.

With every feeling of respect for Mr. Earle, I have been impelled to call the attention of the profession to this controversy between him and Sir Astley Cooper, as Mr. Earle has allowed his doctrines to remain uncontradicted, although not strengthened by the result of his or any other surgeon's practice since his assertions were first promulgated.

I shall now proceed to the circumstances which prevent the ossific union of these fractures, and do not fear the possibility of contradiction, when I think it can be shewn, that it is nature's principle to prevent, rather than to allow the ossific re-union of this part.

In my opinion, old age should be considered as one of the principal causes of non-consolidation of the neck of the thigh-bone, for not only is there that difficulty of reparation, inseparable from the advanced periods of life, but also the peculiar change which had taken place in this part of the body before the accident occurred; rendering it impossible to conceive, how, under such circumstances, re-union is to be expected, when in continuity, the neck of the thigh-bone had not vitality enough to maintain its natural function.

For the reparation of bone also, we are to remember, that the surrounding cellular membrane assists in the process, as well as in the original formation of the osseous system; partly by sending an additional quantity of blood to the wounded periosteum, and partly by adhesive inflammation, limiting the quantity of ossific deposit, and thus, more or less maintaining the natural form of the injured bone. Now in cases of fracture of the neck of the thigh-bone within the capsule, there is no surrounding tissue capable of assisting in the process of reparation; so that the head, and that portion of the neck of the thigh-bone remaining attached to it, is cut off from all supply of blood, excepting to its articular cartilage, and synovial membrane; at least this must be the case, if the periosteum of the neck be torn through.

Hence the inability of the vessels, (which pass on the ligamentum teres to the detached head) to maintain sufficient action for ossific deposition, may be considered as a principal cause of non-union of fractured neck of the thigh-bone within the ligament. I agree with Sir Astley Cooper, that if fracture occurs without separation of the periosteum, that then the parts will be consolidated by bone, as their natural supply of blood is not cut off; and the periosteum forms a limit to the quantity of bone thrown out, without which, a very slight excess of earthy deposit would necessarily destroy the whole function of the hip joint, leading in these cases, almost invariably, to anchylosis,—therefore, I believe it is, that nature has ordained that these fractures are not to be united by bone. It is a law of nature, it is the result of organization, which leads to the ligamentous union, and not the neglect of mechanical means, which has prevented the ossific consolidation, as has been by some asserted. I have no hesitation in saying, that I hold a surgeon as ill-informed in physiology and pathology, who invents mechanical means, to produce an effect which he ought to know is contrary to nature's intention. There are other circumstances to which have been attributed the failure of bony union in these cases, such as the difficulty of producing

perfect coaptation, with the consequent absence of continued pressure upon the fractured extremities, and the effects of the synovia on the extremities of the bone; but the two first of these might readily be overcome by continued extension, and circular bandage, compressing the injured trochanter towards the head of the bone: of the third attributed cause, I can see no reason why synovia should prevent ossific deposit, and indeed as I have before said, believe they have nothing to do in preventing bony union.

The treatment of these fractures is to be regulated under the consideration of the age of your patient, and by the conviction of the uselessness of any attempt to produce bony union. With the first view you would abstain from any apparatus, which, if there were even a hope of its doing good, would necessarily confine the patient at least from two to three months in bed, aggravated too with the constant extension of the limbs; therefore, in old persons, where from slight violence the injury has been afflicted, a well informed surgeon will know that it is from altered structure, and not from physical force that the bone is affected, and will therefore desire that the patient's health should be in every way sustained, and not allowed to suffer under trials to produce union, which must necessarily be abortive. The patient should be placed on the back, and a bolster placed under the whole length of the limb, raising the knee at the same time above the rest of the limb by a pillow; the degree of flexion or extension of the limb will be indicated by the feelings of the patient, ease being the best proof of the proper position; for a fortnight the limb should be left in this position, until all pain and inflammation has subsided, when the patient may be permitted to sit out of bed upon an easy chair, until there is a conscious feeling of being able to bear some slight weight upon the injured limb; crutches may now be permitted, and the patient directed gradually more and more to use the limb, which will tend to strengthen the ligament and muscles, as the employment of natural function will be found the best stimulus to reparation. By this treatment, patients

usually are convalescent in about three months; being then capable of walking with a stick, and although with a halt, still retain a degree of usefulness in the limb, equivalent to the muscular power remaining at that period of life.

If, however, a younger person in full vigour of life, should from the application of considerable force receive an injury to the hip joint, producing many of the symptoms which I have described, I should then submit the patient to the extended position, and the means to produce coaptation, from the hope, that the fracture should have been partly external, as well as internal to the ligament; under which circumstances, ossific union will consolidate the fracture external to the ligament, but still nothing beyond ligamentous union is attempted within. Sir Astley Cooper has alluded to specimens of this kind preserved in different museums. The diagnostic marks of fractures, external to the ligament, are the age of the patient; the degree of injury done to soft parts from the violence necessary to produce this accident, as indicated by immediate swelling and ecchymosis; the excessive pain produced by the slightest motion, and the readiness with which crepitation is felt upon the slightest extension of the limb; these symptoms, requiring active constitutional, and local means to subdue them. It does sometimes happen that difficulties arise in the diagnosis of fractures of the neck of the thigh-bone; these are cases, in which there is neither shortening, eversion of the limb, crepitus, or any difference in the arches described by the rotation of the trochanters; and this absence of symptoms arising from the periosteum of the neck not having been torn through, there can be no reason to see why such cases should not repair by ossific deposition; but the nature of the accident never having been suspected, from the absence of symptoms, there are but few opportunities of investigating them.

Two cases of fractured neck of the thigh-bone within the capsular ligament I shall detail, choosing one out of the very many which offer the usual symptoms, illustrative of what I have described; and the second, in consequence of

the absence of all the symptoms excepting crepitation, and which was perceived only while carrying the patient to bed.

CASE.

Clement Worts, by profession a sailor, aged 72, in trying to get out of the way of a coach slipped and fell upon his right side; and although he did not suffer from the violence of the fall was surprised to find he was unable to rise, and was obliged to be carried to his house, which was near to the spot where the accident occurred. He was then seen by Mr. Kingdon and Mr. Roberts, who pronounced it a fracture of the neck of the thigh-bone, and recommended his removal to Guy's Hospital.

Upon examination it was found that the injured limb was shorter than the other and everted; that he had considerable pain in any attempt to raise it, and which he was incapable of doing: a very slight degree of extension brought the injured limb to its natural length, and upon the cessation of that force the limb immediately assumed its shortened and everted state. During the extension, by rotating the limb a crepitus could be felt; the trochanter upon the injured side rolled upon its own axis, while on the sound side it moved in the arc of a comparatively large circle; still, however, evincing that the change of old age had in some degree taken place in the neck of that thigh-bone; there was, in fact, every symptom present, indicating the nature of the accident. A bolster was placed along the whole length of the injured limb, which was semiflexed, the thigh being somewhat bent upon the pelvis and the leg upon the thigh. The knee was then raised by a pillow, and this position being perfectly easy it was left so through the whole process of its cure. Unrestrained by any apparatus he remained in bed in perfect ease for three months, his constitution even improving during the period of his confinement, not having got out of bed excepting on three or four occasions to have his bed made; at the end of this time, with the assistance of crutches, he was enabled to walk up and down the ward, daily gaining power of supporting a greater weight on the injured side, and can now, five months since the period of the accident, walk with a single stick.

The sudden drop of the body, when its weight is thrown upon the injured thigh, indicates the motion which is permitted by the ligamentous union of the fractured part.

The second case, which I shall now relate, is peculiar from pointing out the possibility of fracture of the neck of the thigh-bone occurring, and without the symptoms which I have described being present.

CASE.

E. P., aged 76, was walking in the street, on January 9th, 1833, when her foot slipped, and she fell with her right thigh bent under her, and upon attempting found herself unable to rise. Mr. Hill, the surgery-man, assisted in carrying her to bed; and, as I afterwards learnt, felt a crepitus, while he was supporting her. I was called to this woman a few hours after the accident, and was requested to examine the nature of the injury. I desired the bed clothes to be withdrawn, so that I might examine the relative length of the two limbs and the position of the feet, when I found the lower extremities perfectly symmetrical, both in length and direction. I then placed one hand on each trochanter major, and desired an assistant simultaneously to rotate the two limbs. The result of this examination was that the two trochanters moved in the same sphere, the radii of their circles being equal. These circumstances induced me to give an opinion that there was no fracture of the neck of the thigh-bone, unless it was one of those rare cases in which the periosteum of the neck was not torn through, and consequently no shortening permitted. I hesitated, therefore, about any further diagnostic mark, and would not put the patient to pain by making any extension upon a limb which was not shortened, as such interference might also rupture the yet uninjured periosteum. My colleague, Mr. Callaway and Mr. Hilton, both examined the case and agreed with me in opinion. The limb was placed in the position as before described; and although she did not suffer more than the usual pain, consequent upon such accidents, she survived but fifteen days.

Upon examination of the body, after death, it was found that the neck of the thigh-bone was broken, but that the periosteum kept the fractured extremities in such perfect apposition as to prevent the shortening and eversion of the limb; the crepitus, which Mr. Hill accidently felt on carrying the patient to bed, convinced him of the existence of the fracture, which upon a post mortem examination was found to have taken place, proving what an important diagnostic mark crepitation is always to be considered; still, it is not always right to persist in searching for it, as much injury may ensue from the efforts made to discover it. *Vide Plate* II.

This is a case in which, had the patient lived, there is every reason to believe, the injury might have been repaired by bone; for with the preservation of the periosteum, was the circulation of the bone sustained, and the limit to ossific deposition preserved. Such are the cases that Sir Astley Cooper has always described as being capable of uniting by bone;

and the specimens resulting from such cases, are those which have been brought before the public, few as they are, with a view to militate against the opinions of Sir Astley Cooper; they are generally only discovered after death, being free from those diagnostic marks which, during life, would lead to the discovery of the nature of the accident.

CASE.

Mary Bailey, aged 67, fell down on January 13th, on the curb stone; and although she did not consider the blow a severe one, found herself incapable of rising, and was brought therefore to Guy's Hospital, and placed in Chapel ward. On examination, the injured limb was found an inch and a half shorter than the opposite; slight extension brought it, however, to the same length as the natural one; and at that time, rotatory motion immediately produced crepitus, and the diagnostic mark of the different spheres in which the trochanters moved. The limb was placed in the position as already described, and in five weeks she was able to leave the hospital, walking with only the aid of a short stick, but limping with the usual gait.

There is scarcely a year but several cases present themselves at Guy's Hospital, the subjects of this accident; and if otherwise, free from any morbid affection, they are pretty sure to recover, with a limb capable of performing locomotion. The symptoms and mode of treatment in all, are however, so similar, that no advantage would be gained by a detail of each case. I shall, therefore, proceed to describe the fractures of other parts of the thigh-bone.

Fractures of the Trochanter major.

The trochanter major is sometimes separated from the shaft of the femur, by a fall immediately upon that portion of the bone; and the nature of the accident is very difficult to discover, as it leads to very little obvious derangement, either in the length or position of the injured limb; and as deformity, with shortening of the limb, (generally from the displacement of the inferior portion) is the effect of fracture, it requires minute examination, and great anatomical knowledge to ascertain this accident. I have never but once met

with fracture of this portion of the bone. Mr. Gaitskill, sen. consulted me about a patient of his, who had been thrown out of his gig close to his own door, falling on the trochanter major. The patient was unable to rise, or when raised, to walk, although he could bear his own weight on the limb of the injured side; he was, therefore, carried to his own house, and Mr. Gaitskill sent for, who, upon examination, found great tumefaction and ecchymosis, attended with considerable pain of the injured hip, but could not discover any fracture. He desired, however, the patient to go to bed, believing that a very few days would restore the limb to its natural state. The patient, however, notwithstanding the strict observance of the plans laid down for him by Mr. Gaitskill, at the end of four days still found himself incapable of moving his limb, and said he felt conscious that his limb was fractured, and I was at that period consulted. From the history given to me, by Mr. Gaitskill, I was induced most minutely to examine this accident, and began by placing the patient with his pelvis in such a position as would enable me precisely to appreciate the comparative length of the lower extremities, which I found exactly corresponding; there was neither eversion or inversion of the foot; all the motions of the hip joint could be produced; the point d'appui of the thigh-bone being evidently maintained within the acetabulum; but these motions of the limb, nevertheless, gave considerable pain; in fact, the only deformity which I could perceive was from the tumefaction of the soft parts about the hip, and I agreed with Mr. Gaitskill, in opinion, that no fracture had occurred. Four days after, I again met Mr. Gaitskill, when I found the patient precisely in the same situation as when I last saw him, namely, being incapable of any voluntary motion of the injured bone, and with the same conviction remaining on his mind, that there was a fracture. I now proceeded most scrutinously again to examine this patient, and got him out of bed for this purpose, desiring him to stand perfectly straight, and with equal pressure, on both limbs; this he could do with but little pain or incon-

venience. In this position, the posterior region of the hip on the injured side formed a greater projection than on the opposite; not like the general swelling of tumefaction, but rather the knotted contraction of muscle. On feeling for the trochanter major, its projection was not perceptible in its natural position; and pressure in this situation was extremely painful to the patient. I now began to suspect the nature of the injury, and searched diligently to discover the position of the detached portion of the trochanter, which, however, partly from the swelling and partly from the small size of the separated portion, I was not enabled to do. I then placed the patient in bed upon his back and desired him to bend the pelvis over the injured side; at the same time I abducted the limb to its fullest extent, and pressing down the glutei muscles, depressed the detached portion of bone so as to feel crepitus of the trochanter; in this position having produced coaptation of the fractured portions, I endeavoured to employ mechanical means to retain them there, by applying bandages and compress upon the upper portion of the trochanter, and drawing it downwards fixed them as perfectly as I could. The patient remained for more than six weeks in this position, and was then permitted to leave his bed; after which, I saw him no more for two years, when he was still the subject of some degree of lameness, but he was capable of performing most of the functions of the injured hip, even to slight feats of agility, although with a halt.

The difficulties of the diagnosis of this case are sufficiently clear from the history which I have detailed, namely, the smallness of the detached portion, and the slight degree of deformity which it produced, and which deformity depends more upon the soft parts than the displacement of the bone: the mobility of the limb in all its natural directions, and in no other, also form difficulties in the diagnosis. When the nature of the accident is discovered, a new difficulty arises as to the best means to be employed for the reparation of the part, as so much difficulty presents itself in producing and maintaining coaptation of the parts; and lastly, the prognosis

is unfavourable, from the circumstance of the detached portion of the trochanter being cut off from its supply of nourishment; for, covered as it is by the tendons of the glutei muscles, and with the synovial apparatus of its bursa, as well as being under the influence of such powerful muscles, render it incapable of uniting by an ossific deposition. This portion of the bone, then, is placed under much the same circumstances as the neck of the thigh-bone, the olecranon process of the ulna, the patella, and the tuberosity of the os calcis; each of which are, I believe, after perfect separation, only reunited by ligament. This occurs not merely from the influence of the muscles, but from these portions of bone being covered by tendon and not by periosteum.

CASE

Of Fracture immediately below the Trochanter Major.

A sailor was admitted into the Accident ward, with fracture of the thigh-bone, occasioned by falling overboard into a boat, and was immediately brought into the Hospital. I happened to be going round with the pupils at the time of his admission, and drew their attention to the case; first, pointing out the circumstances which indicated fracture of the thigh-bone, such as shortening, deformity, loss of voluntary motion, unnatural mobility, and crepitus: this being ascertained I then pointed out to them the propriety of examining the part of the bone fractured, and which is most readily ascertained by a just knowledge of the attachment of the muscles, as it is their influence which gives the peculiar direction to the broken extremities; and in this case the derangement was sufficiently obvious to point out the seat of fracture,—namely, that the upper portion was the most displaced, being drawn forwards by the action of the psoas and iliacus, so that the upper portion formed a tumour in the inguinal region of the fractured thigh.

The result of such an investigation must necessarily lead at once to the proper means of producing coaptation; namely, the relaxation of the psoas and iliacus muscles, and a slight degree of extension from the knee, to counteract the influence of the triceps muscle, would admit at once of the juxta-position of the fractured extremities of the bone; and

both these objects may be gained by the position of the body, first, by raising the patient nearly in the sitting posture, and thus bending the pelvis upon the thigh, the psoas and iliacus muscles are perfectly relaxed, and the upper portion of the fractured bone allowed to descend into the natural position. The limb is next to be placed upon a double inclined plane, so that the weight of the leg may constantly keep up such a degree of extension upon the lower portion of the fractured bone, as to maintain its proximity with the upper, which position is readily maintained by the assistance of splints, taking care that a compress or soft cushion be placed under the anterior splint, so as to press slightly upon the upper extremity of the fractured bone: from five to six weeks is usually sufficient for the ossific consolidation of such fractures, but in the progress of the cure the patient's body should, after a certain period, be raised and depressed daily, for the purpose of producing the motions of the hip joint. With respect to the constitutional treatment, I need not bring to recollection the necessity of paying attention to the general health, even in these local cases, as the reparation will be quick and perfect, as the patient's state approaches nearest to health.

Several cases have occurred in my practice at Guy's Hospital of fracture at the middle part of the thigh-bone, the situation the most likely for the bone to give way, in consequence of the natural curve of the bone. This accident is most frequently produced by jumping from a height, or from being thrown forcibly upon one knee, when the thigh-bone yields midway between the two forces. When this portion of the femur is fractured, the degree of shortening of the limb immediately forms an obvious diagnostic mark; the direction of the fractured extremities of the bone, being, that the lower portion is drawn upwards and inwards by the adductor longus and magnus, and the upper portion is directed outwards by the action of the gluteus maximus muscle, forming a distinct protuberance on the upper and outside of the thigh. Much importance may be placed upon

the investigation of the direction of the fracture, I mean, whether it be oblique or transverse, as from it you will judge of the position in which the patient is to be placed. When the fracture is very oblique, it almost invariably requires the straight and continued extended position to maintain the fractured extremities of the bone in apposition; but, on the contrary, when the fracture is transverse, the surface of the upper fractured portion offers a sufficient and convenient obstacle to the lower portion, being drawn upwards and inwards by the muscle. I am speaking now of simple fractures; for when the accident is compound, there are many other circumstances besides the direction of the fracture to be attended to, such as the laceration of the soft parts, and comminution of bone, which must regulate the position of the limb; so that no general plan can be adopted.

It is not uncommon to have patients brought into Guy's Hospital with fractures in the lower third of the thigh, in which there is but little longitudinal derangement of the fractured extremities, they being directed, so as to form a salient angle outwards by the action of the vastus externus muscle, which being attached to the whole length of the outer side of the femur, little can be done to relax its fibres; therefore the means to be employed to maintain coaptation, is through the medium of a compress under the outer splint. I usually recommend in these cases, the patient to be placed upon the back, with the injured limb extended, and the foot raised, so as to relax the patella and consequently the vastus externus. When the fracture occurs just above the condyles, the accident is dangerous in proportion to its proximity to the knee joint; the limb should be placed over the double inclined plane at a very acute angle, so that the knee joint being thus flexed, the gastrocnemius externus, plantaris, and popliteus muscles are perfectly relaxed, and no longer tend to draw the inferior extremity of the fractured bone downwards and backwards; when the fracture extends, as it sometimes does, through the condyles and into the joint, but little displacement occurs, in consequence of the manner by which

the condyles are surrounded by the vasti muscles; but the great object in these cases, is by perfect rest, and the strictest observance of the antiphlogistic means, to prevent the effects of inflammation upon the joint.

In all cases of fracture, the cause of displacement of the fractured portion is muscle, and as coaptation is necessary for the cure, it is necessary by position to prevent the influence of these muscles, and by constitutional means to subdue their irritability. In fractures of the thigh, there is more difficulty than in any other bone, in consequence of the size and number of muscles attached to it, and the prognosis is more unfavourable from the degree of violence which had produced the continuity of so strong and large a bone. For these objects, various apparatus have been invented, and numerous positions of the fractured limb recommended; however, as I have before said, I believe that no general practice, no constant rule can be laid down as the best. The surgeon's mind in every case, can alone form the means to be adopted, as applicable to the individual instance, bearing in mind, that coaptation must not only be produced, but preserved for a longer or shorter period.

We have but few cases where any difficulty occurs in the reparation of this bone after simple fracture, and when any does arise, it is usually from some irritability, either in constitution or temper of the patient himself. I shall not, therefore describe the various cases which have been kept in my case books as illustrative of this mode of practice, but merely relate such as offer any deviation from the common mode of treatment.

The following case is an important one, as the practice employed deviates from the usual plan of treatment recommended under such circumstances.

CASE.

Richard Weaver, aged 41, a stout, healthy, regular living man, was admitted into Accident ward, on February 5th, with a compound fracture of the lower third of the right femur, occasioned by the kick

of a horse. Upon examination, an oblique fracture of the femur, about three or four inches from its lower extremity was discovered, and a small laceration of the skin, through which the bone had protruded. The fractured extremities of the bone were readily brought into apposition, and the limb was placed upon a double inclined plane with a splint on either side of the thigh, and a piece of lint placed over the wound.

6th.—9, A. M. Has passed a restless night from pain, which he describes as if it were occasioned by swelling of the limb, the splints were therefore loosened, and he was ordered some aperient medicine, from which he derived some mitigation of his pain.

7th.—Had passed rather a better night, but his bowels have not been acted on; he now complains of pain in his knee and foot; the splints were again loosened, and he was ordered some more aperient medicine, and a purgative enema.

8th.—Has had but little sleep, occasioned by a constant sensation of swelling of the thigh and calf of the leg, attended with acute pain of the foot; there is also swelling, and some appearance of ecchymosis in the ham; bowels freely opened; pulse 90, soft; tongue rather coated; skin moist; the splints were removed, and the limb laid on the outer side in the semiflexed position.

9th.—Has passed another restless night; complains of more pain of the ham and thigh, and particularly of the foot; at twelve o'clock, on a particular examination of the limb, I for the first time discovered a diffused pulsation in the ham, which led me at once to the conviction of the artery having given way. My colleagues, Mr. Key and Mr. Morgan consulted with me upon the nature of the accident, as well as its mode of treatment, and we all considered it a case of great importance, and one offering considerable difficulty for decision as to the best mode of treatment. I referred the case to our consulting surgeon Sir Astley Cooper, when we agreed upon the propriety of tying the femoral artery; thus giving the patient the chance of saving his limb, leaving other means to be resorted to, should that operation fail. I immediately therefore performed the operation without removing the patient from his bed; thus saving him the pain and consequent ill effects of removing him to the operating theatre. As the limb was lying in the best possible position I, without moving him, made an incision about three inches and a half long, the centre of which crossed the junction of the upper with the middle third of the thigh, and thus exposed the sheath of the vessels; a considerable arterial muscular ramus was divided, which bled so freely, as to require the application of a ligature. I then opened the femoral sheath, and separating the femoral artery from its vein, and the saphenous nerve, applied a

ligature around it, which upon being tied immediately stopped the pulsation of the tumour and diminished its size. The edges of the wound were then brought together by adhesive plaster, the limb covered with flannel, and the patient ordered to be kept perfectly quiet.

Half-past 9, P. M.—Pulse 102, soft and compressible; tongue furred, but moist; skin natural; bowels have been once opened, but the motion costive and offensive; temperature of the limb natural; expresses himself in every respect relieved; was ordered to take cal: gr. ij. opii gr. j. directly.

16th.—12, M. Passed a tolerably comfortable night; the bowels freely open, but the motions still offensive; pulse 108, irritable and weak; tongue furred, but moist; the limb of a natural temperature; skin natural. He describes, that he has had two slight rigors, and was in fact seized with a third at the time of the visit, but says that he is subject to such attacks; expresses himself altogether more free from pain, than before the operation. I ordered the julep ammon: with the compound rhubarb powder to be taken twice a day, and two grains of calomel with three of Dover's powder at bed time, requesting at the same time, that the effects of the ammonia should be carefully watched, fearful lest it should produce any febrile symptoms.

8, P. M.—Pulse rather irritable; tongue coated with a yellowish fur; bowels twice opened; skin hot and dry; complains of pain in thigh, loins, and head; injured limb somewhat above the natural temperature; one of the flannels therefore desired to be removed; has had no more rigors; a poultice was ordered to be applied to the wound in the thigh; and saline medicine to be substituted for the julep ammonia.

11th.—12, M. Slept rather better than on the previous night; pulse 108, but soft; tongue cleaner at the edges; bowels have been opened three times since yesterday, and the excretions much more healthy in their appearance; the skin still hot and dry, and the injured limb rather above the natural temperature, and slightly livid in the popliteal space, and upper part of the calf, in which situation he feels considerable pain.

6, P. M —Still complains of pain in his loins; pulse 104, but soft; tongue cleaner; the skin somewhat cooler, and slightly bedewed with perspiration. Ordered cal: gr. ij. opii gr. ij. M. h. s. s.

12th.—Slept much better, and expresses himself easier in every respect; the swelling in the ham is considerably diminished, and the temperature of the limb is now reduced to its natural standard. Skin perfectly healthy in every respect; tongue still coated, but moist; pulse 104, rather small, and irritable; bowels freely open. There is a slight erysipelatous blush on the upper part of the thigh, to which a cold white wash poultice was applied.

13th.—12, M. Did not sleep quite so well last night, complaining of considerable pain in the thigh and ham; the erysipelatous appearance on the thigh is somewhat abated; bowels open; pulse 100, soft, but rather small; tongue furred, but moist. The swelling in the ham is now reduced to half its original size, and the wound through which the bone protruded is quite healed. The incision made by the operation is united, leaving only a small opening, through which the ligature makes its exit, and from which there is some slight suppuration. Complains of great pain from piles. Ordered ung: gallæ ʒij. pulv: opii gr. ij. M. ft. ungt:

℞ Conf: Arom: gr. xij.
Conf: Opii gr. x.
Mist: Camp: ʒiss. stat. sumend.

14th.—Slept better last night; the bowels have been freely opened; pulse 100, soft and languid; the erysipelatous blush still remains, but he is free from pain in any part of the limb affected; the expression of his countenance is much more cheerful; tongue cleaner and moist; skin natural; ordered fish for dinner, and a little bottled porter, the effects of which, however, were to be carefully watched.

8, P. M.—The porter has produced no ill effects, but on the contrary, he seems improved by it.

15th.—Passed rather a restless night; bowels freely opened, motions healthy; pulse 100, soft, but still languid; tongue cleaner; erysipelas entirely gone; wound looking healthy, less discharge from it; complains of slight shooting pains in the ham and leg; says that he relishes his fish and porter.

9, P. M.—As he complained of some little pain in the wound this evening, the dressings were removed, fresh ones applied, and a pad of lint placed on each side to press out and prevent the burrowing of the matter. He still complains considerably of the piles.

17th.—Passed a nearly sleepless night, being much disturbed by the groans of a case of compression of the brain admitted in the course of the night. Wound looks healthy, but there is a considerable discharge by the side of the ligature; has slight pain in the thigh and ham at times; skin natural; bowels open; tongue tolerably clean, but moist; pulse 96, soft and still rather languid. To continue his porter, fish, &c.

18th.—Slept better last night; has less pain in the leg; none in the thigh or ham; wound still discharging healthy pus; bowels open; tongue nearly clean; pulse 92, soft and rather improved in tone; skin natural; piles, however, still very troublesome; ate some meat for dinner for the first time since the operation, says he enjoyed it.

19th.—Has been rather restless the last two nights, although he is not kept awake by any pain, having now little or none in any

part of the limb; piles easier; bowels open; tongue clean; skin natural; pulse 90, soft and much improved in tone; wound looks healthy, but there is still considerable discharge; is allowed a bottle of porter daily.

22nd.—Looks better than he has done yet; sleeps well; appetite improved; tongue clean; pulse 84, natural; bowels open; has no pain; wound nearly healed, but still some discharge of healthy pus.

25th.—Continues improving both in health and appearance; sleeps much better, and is in fact improved in every respect; the ligature came away this morning without the slightest application of force; the swelling in the ham is entirely gone.

March 4th.—The wound in the thigh is healed; tongue clean and moist; pulse and skin natural; bowels regular. Upon examination, this morning, the fracture of the thigh was found united, for the patient himself was able slightly to raise the limb. He was from this period considered convalescent.

It has usually been laid down as a law, that in fracture of one of the long bones, and more especially when near to a joint, with laceration of soft parts and with a rupture of a large blood vessel, that the limb should be sacrificed; but even such a complicated injury, as this case proves, does not necessarily incur the loss of the limb; and perhaps there is no greater improvement in surgery, than that part of our science, which has led to the investigation of the powerful means which nature possesses, and the successful efforts which she makes, in producing reparation after severe injuries. Thousands of limbs which are now-a-days saved, were a few years ago condemned, because physiology and pathology were thought less important, and less studied than operative surgery; while on the contrary, the opinion of John Hunter should ever be born in memory, that operations ought rather to impress upon the mind a deficiency, than an approach to perfection in our science.

The patient, whose case we have related, was a healthy man, and but for the laceration of the popliteal artery there would have been no doubt as to a successful result of the case; for neither was the femur comminuted, or the laceration of the soft parts sufficiently extensive to render amputation necessary; the only point, therefore, left for consideration

was, how to obviate the ill effects of the rupture of so large a vessel; for, from the quantity of blood diffused and the absence of any pulsation, either of the anterior or posterior tibial branches, it was clearly the popliteal artery which had given way. Having determined not to amputate, the only plan to be adopted was evidently to secure the bleeding vessel: but this involves two questions; first, as to the situation in which the vessel is to be tied; and, secondly, when tied, whether the reparation of the femur could under such circumstances be expected, and if so, by what means the blood would be conveyed. With respect to securing the vessel, the surgeon would be guided in such a case by the situation of the external wound; for had the wound, in this case, been in such a situation as to admit the escape of the diffused blood, I consider the case would have been entirely altered, and that the limb must have been amputated, or else the wounded artery tied above and below the opening, which, in the popliteal space, could hardly be accomplished; but as the blood did not escape, the coagulum was capable of forming so firm a compression upon the wounded vessel, that upon the application of a ligature above, there was no fear of the recurrence of the hæmorrhage; while on the contrary, if the blood had escaped through an external opening, and the femoral artery had been tied, the collateral branches which convey the blood to the arteries below the rupture, would almost certainly have induced a hæmorrhage from the lower part of the wounded vessel. Hence, in compound fracture, with a laceration of a vessel, it is a great point of consideration whether the external wound does or does not communicate with the wound of the artery; and speaking generally, it may be said that the former will require amputation, while the latter will preclude the necessity.

In reference to the means by which blood would be conveyed to the femur itself, the anatomist will at once understand, that so far from there being any danger of the supply of blood being cut off by this operation, that, through

the profunda branch, even a greater quantity would be conveyed to the interior of the bone; and indeed, I may say in this case, the rapidity of the reparation, and the perfect solidity of the bone equally proved this fact. During the progress of ossific union the limb was allowed to lie upon the outer side, and in the semiflexed position; nor were splints applied until the wound of the thigh was entirely healed, proving how completely mechanical means are but for the purpose of maintaining coaptation of the fractured parts, and that, therefore, the more simple the apparatus to produce this effect the better.

CASE.

Fracture of the Femur from Disease.

Thomas Hough, aged 15, of strumous diathesis, was admitted into Guy's Hospital, on December 19th, 1832, in consequence of an injury he had sustained some time before. His friends, who accompanied him, state, that fourteen or fifteen weeks ago he fell from a tree, by which accident he was partially stunned, but soon recovered himself and walked home, being capable of following his usual avocations the next day, nor did he complain of any pain or uneasiness in his thigh. A month after this accident, he was carrying a large quantity of clay in his left hand, in performing a feat of exertion with his fellow labourers, when overcome by its weight his elbow fell and dropped with some force upon the left thigh, from which he experienced considerable pain; he managed, however, with the assistance of a stick, to walk home, and the next two days walked a distance of half a mile to the pottery; but finding himself totally incapable of work, returned home. From that period he has not been able to walk or bear upon the injured limb; his mother considering the pain which he suffered to be rheumatic, rubbed it twice daily, for a week, with a liniment; but the limb becoming gradually more swollen and painful, she applied to a medical gentleman in the neighbourhood, who ordered leeches, fomentations, and prescribed some internal remedies, but without effecting any improvement in the appearance of the limb, which was very tense and excessively tender; he now became the subject of rigors, cough, and nightly perspirations, from the urgency of which symptoms, at his own request, he was conveyed to Guy's Hospital.

This patient was admitted as being considered the subject of a large fascial abscess in the thigh, attended with cough and pain in the chest, rigors and nightly perspirations.

On the 20th, the day after his admission, I examined the patient more minutely and opened the abscess, which had been poulticed, when about a pint and a half of grumous and offensive matter was evacuated; to allay the irritation under which he laboured, he was ordered a grain and a half of calomel and half a grain of opium directly, and to take saline medicine three times a day. A roller was applied around the limb, both above and below the opening, with sufficient pressure to bring the suppurating surfaces of the abscess in contact, with a view, if possible, to obliterate the cavity, or, at any rate, to prevent the burrowing of the matter; notwithstanding these precautions, the discharge increased in quantity, offensiveness, and the proportion of blood which it contained, and possessed in a marked degree that peculiar smell so indicative of diseased bone.

22nd.—The febrile symptoms were somewhat diminished, but the powers of his constitution were impaired by the quantity of discharge; and the degree of constitutional irritation which was set up, formed one of his most urgent symptoms; his bowels natural.

℞ Quin: sulph: gr. i.
Liq: Opii: sed: gtts. iij.
Inf: rosæ: co. ℥iss. 4tis. horis.

Urgent as the symptoms were at this time, he continued much in the same state up to

Jan. 17th.—The discharge having in some measure increased, being now nearly a pint daily; a small quantity of wine and water was ordered him, but its effects to be carefully watched, as he is the subject of frequent cough: pulse 120, irritable; tongue furred; perspiration profuse.

20th.—Seems certainly better; the wine has evidently diminished his constitutional irritation by increasing his power, and his cough is also diminished; the discharge, however, is still profuse; was ordered a little porter and a whiting for dinner; to continue his medicines.

24th.—The discharge is now very profuse, increasing daily in quantity, offensiveness, and darkness of colour; he is evidently sinking under the increased suppuration.

28th.—During the night a large quantity of arterial blood had escaped from an ulcerated opening in the ham, from the loss of which he died at half-past six. A. M.

Examination after death.—On making an incision into the diseased limb, the cellular membrane of the thigh was found much thickened, indurated, and infiltrated with serum. A large abscess surrounded the shaft of the femur, extending deeply into the ham and half way down the calf of the leg external to the muscles. The lining

membrane of this cavity was very irregular, even sacculated and divided by bridles; it was uniformly a granular, or rather villous membrane, vascular, and greatly discoloured by the contents of the abscess, which was composed of a large quantity (nearly a quart) of dark blood, both solid and fluid, the latter being of a grayish colour and mixed with pus. The muscles around the abscess were pale, attenuated and watery. The head and neck of the femur were natural. The shaft was divided rather above its middle by a ragged transverse fracture; the broken extremities presenting a cancellated appearance as if the compact part of the bone had been entirely removed. Both the upper and lower portions of the shaft of the bone, nearly to the whole extent of the femur, were devoid of periosteum; the superior portion appeared from the ulcerative process as if worm-eaten, but the greater part of its length was encased by a thin layer of new bone, which was continuous with the living neck, and surrounded by a vascular membrane: this membrane was closely applied to the inequalities of the bone.

The inferior portion of the fractured bone was drawn upwards towards the pubes, to such a degree as to shorten the limb three inches, and the fractured extremity was drawn close against the opening of the soft parts through which the blood had escaped. Nearly the whole length of the bone was denuded of its periosteum, even the articular cartilages were loosened and partly ulcerated through. The synovial membrane of the knee joint was full of a reddish gray secretion. A thin spine of new bone, which extended upwards from between the two condyles, and forming the only attempt at ossific union, was gradually taking the place of the old necrotic shaft.

The viserea were healthy, excepting that on the right lung, there was a circumscribed emphysematous lobule; the liver was large and soft, and its texture altered; the rest of the abdominal viscera were healthy.

This case offers very great difficulties, even to admit of any practical deductions, for the symptoms did not lead to the suspicion of fracture, which was not detected until after the death of the patient. When I first examined him, the day after his admission into the Hospital, I found him labouring under all the symptoms of extensive suppuration, with the left thigh swollen, fluctuating, and putting on the perfect character of an extensive sub-fascial abscess; his skin was hot and dry, his countenance anxious, and tinged with hectic flush; the pulse small, rapid, but compressible; and he was complaining of constant and severe pain in the thigh.

From these appearances the impression immediately made upon my mind was that the patient was the subject of an extensive fascial abscess, and probably either psoal or lumbar; to ascertain which, I examined him carefully, but could find no circumstance which led me to attribute his symptoms to any such cause. As I believed his irritative fever was, in a great measure, kept up by the quantity of pus collected, I ordered the abscess to be opened, and gave him the hyd: c: cretâ with opium, to mitigate his sufferings. After the matter was evacuated, which was tinged with blood, Mr. Roberts, my dresser, very properly applied a bandage, both above and below the opening, for the purpose of diminishing the size of the cavity of the abscess; and although he very frequently changed the roller, did not ascertain that the femur was fractured. The question is, therefore, whether the fracture of the femur had occurred upon the infliction of the injury, either from the fall or the blow, which has been described, or from the subsequent effects of disease.

The account given by his friends of his being able, not only to walk but to continue his work after the fall from the tree, and to walk for two days after the blow, unequivocally proves that solution of continuity of the bone could not have occurred upon the application of either of those injuries. We may learn then from this accident, that external injury, as it often produces ulceration and destruction of soft parts, so will it in a similar manner, but by a slower process, effect the destruction of bone. The appearances of the thigh-bone corroborate this opinion, for the whole length of the shaft to the epiphysis was in a diseased state; there may be some difficulty in believing the propriety of drawing any comparison between the diseases and powers of reparation of bone and the softer parts of the body, but it is nevertheless true, that they are similar in every respect, excepting in the period of their progress. That hardness which has already been described as forming the grand characteristic of the osseous system, is produced by the deposition of phosphate of lime into the animal substance of the bone, and to this is to be

attributed the tardiness of the vital action; this is shewn by the fact, that in the earlier periods of life, when the animal matter of bone preponderates, their diseases put on a more acute character; while, on the contrary, in old age, when the earthy substance is most abundant, the diseases of bone are of a more chronic nature; but the slightest blow will produce fracture, both from the altered physical as well as chemical properties of the bone at this period. As I have before said, the formation of a node, the process of caries, and the completion of necrosis, are similar to the deposition of adhesive matter, ulceration, and sloughing of the soft parts. In this case, then, I am induced to believe, that the patient, who offered the common indications of a scrofulous diathesis, or from some other peculiarity of constitution, had not the power to repair the injury inflicted upon his thigh-bone by the local causes described; and that, therefore, the inflammation went on to the ulcerative stage, producing the separation of the thigh-bone, leading to all the symptoms described, and to the death of the patient. There is some doubt whether the opening through the artery was produced by the bone or by the process of ulceration; from the situation of the broken bones, as well as the appearance of the opening after death, there was reason to believe that the fractured extremity of the bone was the cause of the hæmorrhage.

The next case which I am about to relate, is one which is peculiar from a fractured femur not having united, for nearly two years after its solution of continuity, although there was no apparent local or constitutional circumstance which could be considered as likely to retard its process of reparation.

It will be proper, however, in the first place, to consider those circumstances which most frequently retard the reunion of a fractured bone. It would be expected, that in old age, when the bones have undergone the change peculiar to that advanced period of life, and in whom all the powers of preservation, as well as of reparation are impaired, that there would be difficulty in the consolidation of a fractured bone; or if the patient was at the

same time labouring under any specific disease, such as scrofula or schirrous, it might also be expected that there would be at least a difficulty, if not an interruption to reparation of bone, as well as to the power of reparation in soft parts, which we know to be always retarded under these circumstances. The local causes of prevention to consolidation of bone are more easily comprehended, and depend principally upon such mechanical circumstances as interrupt the coaptation of the fractured extremities of the bone, and of the application of the mechanical means which are to retain them. The difference of the vital powers of the different parts of particular bones is also another cause of non-union. Thus for instance, the difficulty of coaptation may arise from the peculiar direction of the fracture, from the intervention of some other structure between the extremities of the bone, or from the difficulty which may occur in keeping the fractured bone perfectly immoveable. Fractures of the neck of the thigh-bone, of the patella, of the olecranon process of the ulna, and of the tuberosity of the os calcis, are all instances of the want of sufficient vitality to secure ossific consolidation; indeed it seems as if all such parts of bones as received their periosteum immediately from tendon, were repaired with considerable difficulty. This fact, however, leads to the consideration, whether it be that the tendon distributes vessels less capable of producing bone, or whether it be that the function of tendon, namely, the concentration of motion, is the cause of this want of bony union.

With these views, it is the surgeon's object by medicines to alleviate the constitutional causes, and by the application of apparatus to obviate the physical interruptions to the process of reparation.

Of the constitutional means, it is impossible to give any idea as to the general treatment which may be required, but the powers of the constitution may be invigorated by the use of wine and generous diet, or by the application of such medicines as are considered appropiate to any specific disease under which the patient may be labouring; and with respect

to the local means, as I have before said, they are the application of apparatus to produce perfect adaptation, and to prevent every kind of motion. Notwithstanding, however, the most judicious administration of all these means, it does sometimes happen that the fractured ends of the bones do not unite, and require further attempts to produce the desired effect; such as cutting down upon the fracture, and sawing off the extremities of the bone, passing a seton through the supernumerary joint, and even electricity. Each of these means have been advocated as useful under such circumstances.

CASE.

Ann Starling, aged 35, apparently of healthy constitution, in November 1831, was thrown from a coach and fractured her right thigh; upon being carried home, a surgeon was sent for, who, in consequence of the extent of tumefaction, applied evaporating lotions, and means most likely to reduce the inflammation without the application of any splints; the degree of injury to the soft parts was sufficiently violent to preclude the propriety of using splints for ten days, when the limb was placed on a double inclined plane, and remained in this position without any untoward circumstance happening for six weeks, at which time, upon removing the splints, and on examining the state of the fracture, it was found so slightly united as readily to admit of separation, and in fact the case at once put on the formidable appearance of non-united fracture of the thigh. It was then put into the same splints for seven weeks longer, at the end of which time it was still found non-united, she was therefore sent to Guy's Hospital, March 14th, 1832, when her limb presented the following appearance. Longitudinal derangement occasioned by the lower portion of the fractured bone being drawn upwards, inwards, and forwards. Considerable deformity was also produced from the quantity of callus thrown out; and by examination, it was found, that consolidation had not occurred, as by making slight extension, the fractured extremities moved upon each other, communicating a sensation of their being rounded by a process of absorption.

Upon taking into consideration the circumstances which usually retard the consolidation of a fractured bone, there was nothing here which could be found either constitutionally or locally to which could be attributed the failure of ossific union. The limb was therefore again placed upon a double inclined plane, pressure was made immediately

upon the fractured extremities of the bone, by the adjustment of a broad leathern strap with buckles, the splints applied in the usual manner, paying at the same time every attention to the state of the constitution; trusting by a continuation of the second treatment for the duration of six or seven weeks, that the fractured surfaces might be rendered disposed to unite, even after this advanced period at which they usually consolidate.

Every attention was paid to this woman by the dresser, and she herself adhered strictly to every injunction which was given her. She persevered in these means for the space of five or six months, but again we were disappointed at finding that bony union was not completed, although undoubtedly there was an improvement as to the approach towards consolidation. The apparatus was again applied, and with increased force, but was soon obliged to be diminished in consequence of the great swelling which it produced; the extension, therefore, was continued, leaving off the pressure, so that the limb might recover itself. I then consulted with Sir Astley Cooper upon the propriety in this case of resorting to some operation as a last resource, and he agreed with me that as the formidable operation of cutting off the extremities of the bones offered but a doubtful result, her condition should be explained, leaving her to judge for herself whether or not she would run the risk of such an experiment. I put her in possession of the result of our consultation, proposed to her the operation, which she declined, and the limb was again placed in the apparatus: considering that the treatment must be prolonged either until the cure was completed, or the case deemed hopeless. She has now been fourteen months in the Hospital, and although constantly confined to her bed, immoveably fixed in one position, and subjected to the painful adjustment of the apparatus; still her constitution and her general appearance has remained so unchanged that even yet our efforts promise to be crowned with success by a perfect bony consolidation.

Upon a minute examination of the limb, on June 15th, 1833, there was no doubt of union having taken place, but still it does not communicate to my feeling the conviction of there being sufficient ossific matter to bear the weight of the body. This scarcity of earthy deposition, I attribute in some measure to the perfect cessation of muscular action, as well as apparently to some cachectic diathesis in the patient herself. I have now desired that she should be raised in bed, and gradually made to put different muscles in action, until by degrees she may be enabled to bear some weight upon the fractured limb, thus leading to perfect consolidation, by inducing earthy deposition, through the natural stimulus to its growth, namely, motion and pressure.

Fractures of the Bones of the Leg.

Very many cases of fractures of the leg have occurred in my practice at Guy's Hospital, but to detail the particulars of each would be tedious without being useful. I shall therefore only give a general view of the principles which regulate our practice in that Institution under such accidents.

In taking a physiological view of the fractures of the tibia and fibula, a great similarity immediately presents itself to the accidents of the bones of the fore-arm; in the leg, however, both bones are most frequently broken; while in the fore-arm, it is the radius only which is usually fractured; this difference occurs upon the peculiarity of the articulations of the bones. In the arm, the radius is most frequently fractured alone, on account of its receiving the whole weight of the body when falling upon the hand, with which it is articulated; but from the weight of the body not being perpendicular to the hand, the force is not continued in a direction so as produce fracture of the ulna; while on the contrary, by a fall on the feet from any considerable height, the tibia, (as the radius, in the other accident,) receives the whole weight of the body, yields to the application of so great a force, and which force being perpendicular to the bones, continues to operate, and the fibula becomes subsequently broken. Both bones, however, may be simultaneously broken, and parallel to each other by a force applied immediately on the part of the bones fractured, as when a heavy weight passes over the limb. From the projection of the knee and ankle joints, it is the middle of the bones which usually give way upon the passing of a wheel over the leg.

From whatever cause, the bones of the leg when fractured, are subject to the displacement of their broken extremities in every direction, in consequence of the numerous muscles by which they are influenced. The derangement in a longitudinal direction but rarely occurs, in consequence of the

extent of surface of the fractured bones, and from the lengthened attachment of the muscles. When, however, it does occur, the lower portion is almost always drawn backwards and outwards by the muscles of the calf of the leg; while the upper portion is directed forwards, and inwards, by the action of the sartorius, gracilis, and semitendinosus muscles. The usual position of the fractured extremities of the tibia and fibula is angular, and may be produced, so as to form the salient angle, either forwards, backwards, or to either side. When the angle is salient anteriorly, it may be produced by the action of the muscles of the calf of the leg, or by the weight of the body, and the position of the foot, as its being depressed or placed too much on either side, will produce the salient angle, either backwards, when the foot is too much raised, or to either side, when too much laterally inclined. The diagnosis of such an accident is formed from the degree of pain, the loss of motion, the altered form of the limb, and the crepitation which is felt upon rotation of the foot; all being immediately the result of the application of some external force. Superadded to these symptoms, there may be extensive laceration of soft parts, communicating with the fractured extremities of the bones, producing what is termed a compound fracture; comminution of the bone, and the laceration of blood-vessels may also render the case more complex, and the prognosis more uncertain.

With respect to the treatment, whether the fracture be simple or compound, when it is intended to save the limb, the means are the same; in placing the fractured extremities in perfect apposition; in making extension from the foot, and counter extension from the knee; and then by applying any apparatus which may appear to the surgeon the best adapted to maintain the bones in situation. As to the mode of fixing the apparatus, or of the kind of padding to be used, I think it a matter of but little importance, although so much fuss is made by the inventor of every new splint; but whether it be air or water, bran or chaff, they must still require the

surgeon's head to direct the hand for their judicious application, and the more simple the means, the more certain, I believe, will be the benefit derived. One of the principal objects to be attended to in fracture of the bones of the leg, is to perfectly fix the foot; for while the patient is lying on his back, (the usual position in fractures of the leg,) it has a great tendency to fall on either side, producing at once a derangement of the fractured portions of the bone. Another important point is, in perfectly padding the heel and hollow of the tendo Achillis, so that the pressure is equable, and sloughing prevented; care must be taken, however, that the heel is not too much raised, so that the lower portion of the fracture is made to produce a salient angle backwards. The apparatus usually requires to be applied from five to six weeks, during which time, however, the surgeon should frequently examine, whether the bones remain in apposition; and when it is found that the callus is sufficiently strong, the splints may be taken off, a bandage applied around the limb, and the patient permitted first to sit up, and then assisted by the aid of crutches, gradually to throw more and more weight upon the limb in the act of progression.

The tibia is sometimes fractured alone, and in consequence of the support which it gains from the fibula, and from the extent of surface which this large bone offers, it is sometimes difficult to discover the nature of the accident, and it has even been said by some writers, that patients have been able to walk at the time this bone was broken; but when there is reason to suspect this occurrence from a fall, or a blow upon the tibia, its anterior angle is so slightly covered by soft parts as to admit of a most perfect examination of the slightest inequality which may exist, and consequently, the extent of the injury may be thus ascertained. The fibula from its mode of articulation with the tibia, will not allow of sufficient separation of the fractured portions for crepitus to be produced; but, by making a pretty forcible extension, and counter extension, any slight derangement which may have occurred, admits of being readily corrected. The after

treatment of this fracture is the same as when both bones are broken. The fibula is also sometimes fractured alone, but this does not so frequently occur as one would be led to suppose from its slender form, for this evident reason, that it is not bearing any portion of the weight of the body; its principal use seeming to be, the preventing too extensive an abduction of the foot; hence it is, that in running, any thing striking the inside of the foot and preventing its progression, is one of the most frequent causes of fracture of this bone; falling sideways, when the foot is fixed in a deep cleft, will also produce this accident.

Whatever may be the cause of fracture of the fibula, there is never any shortening of the bone, but the fractured portions are drawn inwards towards the tibia, diminishing the interosseal space, rendering, therefore, this a similar diagnostic mark to fractures of the fore-arm; but it may also be ascertained by pressing the fibula towards the tibia, when a motion will be perceived, and sometimes by rotating the foot with one hand, and grasping the fractured portion in the other, a crepitus may be felt, which after all, forms the most certain diagnosis of fracture. If the fibula be broken obliquely through the malleolus externus, or immediately above it, and there be at the same time considerable tumefaction of the ankle-joint, there may be great difficulty in discovering the nature of the injury; but under these circumstances, at any rate, the surgeon's mind would be directed to the diminution of the inflammation, rather than to the fracture. If the fracture of the fibula occurs from a fall from a great height upon the feet, it frequently happens that the astragulus is dislocated inwards at the same time; this dislocation is readily reduced by a slight degree of extension, and counter extension, and then the treatment would follow, as if dislocation had not occurred. I mention this complicated injury in this place, to recommend that notwithstanding the inflammation which is likely to follow this accident to the ankle-joint, that still, splints with a foot piece should be applied on each side of the foot,

for fear some muscular spasm should induce a recurrence of the dislocation, an accident which I have known to occur under the following circumstances.

CASE.

While dressing for Sir Astley Cooper, a patient was brought into Guy's Hospital, the subject of fracture of the fibula with dislocation of the astragalus inwards; the dislocation was easily reduced, but in consequence of the degree of tumefaction, I merely placed the limb in the semiflexed position, and applied evaporating lotions, without employing any means for maintaining the coaptation; during the night the patient was seized with an epileptic fit, to which he was liable, and the foot became again dislocated by the convulsive action of the peronei muscles.

This case sufficiently points out the necessity for guarding against such an accident, and of applying splints, but without such pressure as would increase the tendency to inflammation. The treatment, which a fractured fibula requires, is splints, either furnished with an outer foot-piece or sufficiently long to pass below the foot; the limb should also be placed in the semiflexed position upon the outer side; this precaution to fix the foot is always necessary, or the constant action of the peronei muscles will have a tendency to produce a permanent eversion of the sole. Sir Astley Cooper, in his description of this accident, relates a case of permanent lameness, being the result of the foot becoming twisted subsequently to fracture of the fibula, in consequence of neglecting the application of splints.

Various have been the cases, as I have before observed, admitted into Guy's Hospital with these accidents; and by following attentively these rules, which I had learnt at the same school, we have rarely any important deformity, leading us to regret their application. The cases of fracture of the bones of the leg most difficult to treat, and which require the most frequent adjustment, are those in which there is the greatest obliquity of fracture, requiring not only the more constant application of the extending and counter-extending force, but also the employment of com-

presses, or the raising of a depressed portion of bone, by the use of a piece of tape or bandage applied as a sling, so that the pressure may be immediately upon the part intended to be acted on.

Fractures of the Bones of the Upper Extremities.

The fractures of the long bones of the upper extremity are treated in a manner so similar to the injuries of the bones of the lower, that it appears to me unnecessary separately to detail the cases which have occurred under my care; it may be said, however, speaking generally, that the prognosis is more favourable and the cure more rapid, in consonance with that law of nature which has already been alluded to, that the bones which were first formed, are the most rapid in their reparation after injury. Upon taking a view anatomically, physiologically or pathologically, of the bones of the upper and lower extremities, it will be found that a great similarity exists between them; the resemblance of the scapula to the bones of the pelvis, of the humerus to the femur, of the radius and ulna to the tibia and fibula, and of the bones of the hand to the bones of the foot, must strike the most cursory observer. The functions which these parts have to perform are also very similar, the greatest difference existing between the scapula and the pelvis; but still the scapula may be considered as a flat bone, assisting to protect important organs contained within a large cavity, and forming an articular surface for a diarthrodial articulation. With respect to its accidents it is comparatively less liable to fracture than the pelvis, in consequence of its much greater degree of mobility; but when fractured, the same mode of treatment is necessary to insure its reparation, namely, the application of bandages, so as to prevent any motion of the fractured bone. There is not, however, in this case, the same fear of any important viscus being injured, yet it is right to desire the patient to abstain from any violent respiratory action, as the scapula is, in some measure, implicated in that function.

Fractures of the Scalpula.

The situations in which fractures of the scapula usually occur, are, either at the acromion, or through the body of the bone. Fracture of the acromion may be readily discovered from the loss of roundness of the shoulder, in consequence of the deltoid muscle drawing the extremity of the acromion downwards, while the trapezius and levator scapulæ muscles draw the scapula, with its attached portion of the acromion, upwards and backwards. Authors have described fractures of the coracoid process of the scapula: no such case has ever occurred in my practice at Guy's Hospital, nor, I believe, is there any museum in Europe which possesses a preparation of the kind; the deep situation of this portion of bone, and the manner by which it is protected from injury in every motion of the upper extremity, render it, in my opinion impossible to occur, unless from a gun-shot wound, or some such application of a concentrated force. I have had under my care, a fracture through the anterior angle of the scapula, including the acromion, neck, and coracoid process, producing very much the appearances of dislocation of the humerus into the axilla; the flatness of the shoulder and increased length of the upper extremity, forming diagnostic marks to both accidents. The absence, however, of the projecting acromion and the degree of mobility of the injured limb, distinguishes readily this fracture from the dislocation; but, to insure the diagnosis in the fracture, all deformity may be at once removed by raising the injured upper extremity by the elbow, when the depressed shoulder is easily elevated to its natural situation, at which time a crepitus may be perceived; and again immediately on ceasing to support the elbow, all the former symptoms recur.

In the treatment of this accident a large pad is to be placed in the axilla, the arm bound to the chest by applying a bandage around the trunk, and afterwards by carrying several turns of this bandage from the elbow to the shoulder,

it produces the effect of a short sling; care, however, being taken that the bandage, as it passes over the shoulder, rests upon the fixed and not on the fractured portion of the scapula; to effect which, one or two turns of the bandage may be carried across to the other shoulder. The treatment of fractures of the acromion only, is precisely similar to that just described.

Fractures of the Clavicle.

Although the clavicle may be considered as one of the long bones, still there are some peculiarities in its fractures, which require to be described. The use of the clavicle is to form a very strong arch for the purpose of preventing the arm being brought too far forwards and inwards, and its point d'appui is the sternum, hence it is that the fall on the shoulder, by driving the clavicle with great force against the sternum, produces a contre coup, so that the clavicle gives way in its centre; the arm immediately drops to the side, the patient can no longer raise his hand to his head, the injured upper extremity, like the fore leg of a quadruped, appears as if intended to sustain the weight of the body, rather than to act as an organ of extensive motion. Upon closer examination, the scapulary portion of the clavicle will be found drawn downwards and inwards, by the weight of the arm and the action of muscles, while that portion of the clavicle attached to the sternum, so projects against the skin as to give it the appearance of being the displaced portion of bone. All this deformity may be at once removed by the surgeon raising the injured arm by the elbow, at the same time placing his wrist in the axilla of the patient, and bringing the elbow to the side; a fulcrum being thus formed in the axilla, the whole shoulder is carried outwards, as the elbow approximates the side, thus coaptation of the fractured extremities of the clavicle is produced; when, placing a large conical pad with its base in the axilla, and a long bandage around the chest, including in its folds the whole length of the upper arm of the injured limb, for the purpose

of keeping the elbow to the side, are the mechanical means to maintain this coaptation. Without a pad in the axilla and the elbow being brought to the side, the stilette bandage, which is most frequently employed in these cases, can only lead to the most pernicious effects, by bringing the scapulæ nearer to each other, when the object ought to be, to separate them.

Fractures of the Humerus.

This bone may be fractured in any part of its extent; but as in the description given of the fractures of the femur, the position of the displaced portions of the humerus will vary according to the situation of the fracture, in consequence of the diversified action of the muscles attached to it; there needs, therefore, no stronger proof of the necessity of a thorough knowledge of the action and attachment of muscles, to be enabled perfectly to understand all the circumstances connected with fracture, both as to diagnosis and treatment. It becomes, therefore, highly important to speak of the different situations in the os humeri, in which, when solution of continuity occurs, the direction of the fractured extremities forms the diagnostic mark.

Fracture may take place through the neck of the humerus above the tubercles, and consequently within the capsular ligament. This is, however, an accident of but very rare occurrence, and somewhat difficult to discover in consequence of the slight deformity which takes place, as the fractured portions of the bone are retained nearly in the natural situation by the capsular ligament. The shaft of the bone, however, is drawn slightly upwards and outwards by the spinati muscles, and the natural rotundity of the shoulder is but little altered: by placing the palm of the left hand over the shoulder-joint, and rotating the humerus from the elbow, crepitus is readily felt. The appearance of the shoulder-joint in this accident is very similar to a partial dislocation; but its mobility, and crepitation, at once distinguish it.

Sir Astley Cooper, in his Treatise on Dislocations and Fractures of the Joints, fifth edition, p. 411, describes this accident, and gives an account of the dissection of the parts after death. Mr. Ward, a surgeon at Watford, in Hertfordshire, had a son, who was the subject of this accident, at a period when it was probable that the epiphysis had given way. I must confess myself to be rather sceptical with respect to the frequency with which this accident is described to occur, as I have never yet had an opportunity of seeing a preparation in which the reparation of such an accident had happened. The treatment for such an accident would be to place a pad in the axilla, to confine the arm to the side, and to surround both shoulders with a bandage, so as to press the fractured portions of the bone firmly together.

The humerus is sometimes the subject of fracture immediately below the tubercles, between the insertions of the spinati and subscapularis muscles, above, and the pectoralis major, latissimus dorsi, and teres major below: this accident has been mis-named fracture of the neck of the humerus, but the true anatomical neck of this bone is above the tubercles.

Upon the first view of this accident, a surgeon might be led to suppose that the deformity depended upon a dislocation of the head of the bone into the axilla, but attention to the following circumstances will lead to a correct diagnosis:—the roundness of the shoulder is more than naturally prominent, immediately below which, upon the outer side, there is a deep cleft, from the lower fractured portion being drawn inwards by the action of the pectoralis major, latissimus dorsi, and teres major muscles, while the prominent rotundity of the point of the shoulder is increased by the action of the spinati; the whole limb is moveable, and a very slight degree of force readily restores it to its natural position, but, no sooner is this force withdrawn than the deformity returns; on rotating the humerus from the elbow, the head of the bone will be found quiescent

within the socket; and, lastly, the patient experiences the same difficulty in raising the hand to the head, as occurs in fracture of the clavicle, from the loss of its fulcrum. Several such cases have occurred to me at Guy's Hospital, and I have never experienced either a difficulty in judging of the nature of the accident, or of the means to be employed for its remedy. A conical pad, with its apex in the axilla and its base downwards, should be confined on the inner side of the arm by a splint. A long splint with padding is then to be placed on the outer side of the arm, reaching from the acromion to below the external condyle of the humerus, with a compress, particularly acting upon the upper fractured portion; a short splint may also be placed upon the anterior and posterior part of the arm, in order to prevent displacement by the action of muscles, and the whole extremity may then be confined to the chest by a bandage. The difficulty of maintaining coaptation depends upon the degree of obliquity of the fractured portions.

A third situation in which fracture of this bone occurs is in a space bounded above by the insertions of the pectoralis major, latissimus dorsi, and teres major muscles, and below by the insertion of the deltoid. The position of the fractured portions of bone in this accident, is very different to the last described; for in this case, it is the lower portion which is drawn upwards and outwards, and the upper which is drawn inwards towards the chest; hence, at once, the surgeon may know the precise situation of the injury, and the means to be employed to obviate the deformity and insure reparation. Extension and counter-extension is to be made to adapt the fractured surfaces, which are to be retained in apposition by the judicious application of padding and compresses when particular pressure is required, and rendered secure by splints and bandages, at the same time confining the arm close to the trunk, in such a position, so as to relax those muscles which have a tendency to displace the fractured portions of the bone.

The humerus is sometimes broken below the insertion of the deltoid muscle, and at that part of the bone which is covered anteriorly by the brachialis internus, and posteriorly by the triceps extensor cubiti muscle; this portion of the bone, from its thickness, admits of but little displacement in a longitudinal direction, unless the fracture be very oblique, but a salient angle is formed forwards, in consequence of the lower fractured portion being drawn in that direction. When this fracture happens very near to the elbow-joint, it is liable to be mistaken for a dislocation of the radius and the ulna, but the diagnosis is rendered clear by making extension, when all signs of dislocation are lost. The fracture sometimes extends through the condyles, so as to separate them; the internal condyle is more frequently separated from the rest of the bone than the external, in consequence of its being less covered by soft parts. This accident puts on much the same appearance as the dislocation of the ulna backwards, from the internal condyle being drawn in that direction, through the action of the triceps muscle; but a just knowledge of the relative position of the condyles, with the olecranon process of the ulna, as well as the fact, that by slight extension, the natural position being thus gained, a crepitus will be directly detected, and lead to a discovery of the nature of the injury. The treatment in both of the last described accidents is the same, namely, to bend the fore-arm at a right angle with the upper, and maintaining the broken portions of the bone in their natural situation, by means of wetted pasteboard; at the same time keeping the elbow-joint constantly wet with evaporating lotions as long as any inflammation remains.

When the external condyle is fractured, swelling, inability to perform the motions of the elbow-joint, and crepitus, are the diagnostic marks; the crepitation may generally be discovered by making extension from the hand, and then producing pronation and supination of the radio-ulna articulations. The treatment in this case, is the same as in fracture of the internal condyle; for in both of them, as indeed in

all accidents near to the elbow-joint, passive motion should be early employed to counteract the tendency to anchylosis. There is but little difference, it appears, in the principle of the treatment of fractures of the humerus and of the femur; in both, it is the action of the powerful and various muscles, with which you have to contend; but the difficulty of the application of the means, and the necessarily continued confinement of the patient, under the latter accident, makes the prognosis less favourable than in the former.

Fractures of the Fore-arm.

The analogy is equally strong with respect to the accidents of the bones of the fore-arm, as compared with those of the leg, but in the former, one bone only is more frequently broken, in consequence of its being alone attached to the hand, and placed in a direct line with the humerus; while on the contrary, with respect to fractures of the bones of the leg, both are usually broken, for reasons already detailed, when speaking of the accidents of the lower extremity. The principal diagnostic mark of fracture of the bones of the fore-arm, is, a diminution of the interosseal space, and a consequent projection of the muscles, both upon the anterior and posterior surface of the arm, so as to give an unnatural rounded appearance; this occurs from the approximation of the fractured extremities of both bones towards each other, when both are broken, or of the broken bone towards the sound one, when only one has suffered from solution of continuity.

Fractures of the Radius.

The diagnostic marks of fracture of the radius, are, permanent pronation of the hand, the degree of pain which is experienced in effecting the motions of pronation and supination, and by the sensation of crepitus which is distinguishable during the time the hand of the patient is pressed towards the ulna; the surgeon by drawing his hand along the radius, will perceive the precise position of the fracture, by the salient angle which is formed inwards towards the

ulna, and also by the ready motion of the fractured portions in that direction from the slightest pressure; the comparative degree of the direction inwards, between the upper and lower fractured portions, depends upon the proximity of the fracture, either to the pronator radii teres, or pronator quadratus muscles.

The treatment in these cases, consists of placing compresses, most convex towards their centres, upon the anterior and posterior surface of the fore-arm, and maintaining them in that situation by the application of splints, with a sufficient degree of force to confine the muscles in the interosseal space; the bandages which retain the splints should not confine the hand, which is to be placed in a position between pronation and supination, and much directed towards the ulna; thus preventing the action of the pronator quadratus muscle, a circumstance, of all others, the most essential to secure a perfect reparation in fractures of the radius.

When the fracture of the radius happens immediately through its neck, its diagnosis is more difficult, in consequence of the quantity of muscle which covers this part of the bone. The nature of the accident is further obscured by the difficulty in producing crepitus; this arises from the inferior fractured portion being drawn upwards, inwards, and forwards, by the action of the biceps muscle; while the upper portion is directed outwards by the supinator radii brevis. The accident may be discovered, however, by the surgeon placing the thumb of his left hand upon the head of the radius, when on rotating the hand of the patient, he will find the head of the bone does not obey the motions of the shaft; then by flexing the elbow-joint, and proning the hand, the crepitation may be discovered, and in this position, the limb is to be secured for the consolidation of the bone.

CASE.

Janet Westbrook, aged 68, was pushed down in the street, thrown forwards, and on thrusting her hand out to save herself from the effects of the fall, it came in contact with the curb stone; the consequence of which was, fracture of the radius, about two inches above the styloid process; she was immediately brought into Guy's Hospital, on February 26th. The swelling being but inconsiderable, the nature of the accident was immediately ascertained; presenting the usual symptoms, namely, fixed pronation of the hand, diminished width of the lower part of the fore-arm from the approximation of the fractured extremities to the ulna, and the rotundity produced by the displacement of the muscles and tendons from the interosseal space. The limb was put up in the ordinary way, the hand being left pendent; in the course of five weeks she left the Hospital, with perfect motion of the radio-ulna articulations.

I have mentioned this case, simple as it is, merely because it is illustrative of the principles which are laid down, to form both the diagnosis and treatment of such accidents. Other cases I might detail, but the similarity in diagnosis and result render it unnecessary.

Fractures of the Ulna.

The ulna is less liable to fracture than the radius, as may be deduced from the circumstances already mentioned; when it occurs, it is usually produced by the arm being raised for the purpose of defending the head from a blow, and the force falling immediately on that portion of the bone least covered by soft parts, it gives way, and generally near to its lower extremity, which is smallest. The signs of this accident are, an irregularity at the point of fracture, in consequence of the lower portion of the fractured bone being drawn outwards by the action of the quadratus muscle; while the upper portion of the ulna, produces a very perceptible projection on the inner side of the arm, from its remaining perfectly fixed; there is also a loss of width in the lower part of the fore-arm, and a projection of muscles, both upon the anterior and posterior surface, forming a further diagnostic mark.

Fracture of the olecranon process of the ulna not unfrequently occurs, and it is said sometimes to happen from the inordinate action of the triceps muscles, but a more frequent cause is a fall upon the point of the elbow. When the olecranon is detached, it is immediately drawn upwards, being elevated from one to two inches by the action of the triceps, the interval between it and the ulna, increasing or diminishing by the action of flexion, or extension of the forearm; this separation is usually sufficiently evident to form an unerring diagnostic mark, but tumefaction immediately upon this part, sometimes obscures it. The detached portion of olecranon is readily moved from side to side, and the ulna not partaking of the motions of the olecranon, proves the solution of their continuity, the patient has but little power to extend the limb, but that of perfect flexion. One of the strongest diagnostic marks, appears to me to be formed by taking a lateral view of the injured arm, when the posterior surface presents much more the appearance of the anterior, in consequence of the contracted triceps bearing the resemblance of the biceps muscle in action. When all these described symptoms are evident, nothing can be easier than to understand the nature of the accident; but when the injury to the elbow-joint is very great, and the swelling considerable, the diagnosis may be difficult. Under these circumstances, the surgeon's mind would be directed, first, against the inflammation, which upon being allayed, it will become easy to discover the extent of the injury.

The treatment to be followed in fracture of the olecranon, differs from that of all other accidents of the elbow-joint, in the necessity of placing the form-arm in a perfectly extended position, for the purpose of bringing the divided portions of the olecranon into apposition; this may be accomplished, by gradually drawing down the triceps muscle; and by the pressure of a bandage, the irritability of the muscle may be so diminished, as to enable the surgeon to bring the fractured portion of the olecranon into perfect contact with the ulna: in which position it is to be retained, by the ban-

dage being continued across the elbow-joint in the form of a figure of eight; previously to the application of these oblique casts of the bandage, care should be taken that the skin does not sink between the divided portions of bone, and prevent their apposition. The anterior hollow of the elbow should be filled with lint, and a long splint applied, to maintain the extended position of the limb, which is essential to the reparation of the bone. In about a month the splint is to be removed, and passive motion of the joint employed, but however with considerable caution, as the reunion is only effected by means of a ligamentous substance, the extent of which, depends upon the perfect adaptation of the parts.

Compound fracture of the olecranon is to be treated as a simple frature, attempts being made immediately to reduce it to that accident, by promoting the union of the external wound; perfect rest, and a more strict antiphlogistic regimen to prevent inflammatory symptoms, must be attended to in this more complicated form of acccident.

I shall describe one case of fracture of the olecranon, as there were at first difficulties in forming a diagnosis.

CASE.

Mr. H., aged 27, on the 25th of April, 1831, was thrown from his horse, and his left elbow first came in contact with the ground; in about an hour after the accident, I found the elbow-joint very much swelled, and especially just opposite to the centre of the olecranon, presenting a rounded, circumscribed, soft tumour, into which the finger very readily sunk; but as yet I could discover no separation of the olecranon. Upon desiring the patient to use the elbow-joint, he had the power of equally extending and flexing the fore-arm, with such facility, and to so great an extent, that I doubted the existence of fracture; and not until three days after, when the tumefaction had subsided from the application of leeches, and evaporating lotion, was I enabled to decide upon the nature of the accident.

This gentleman had had the olecranon of the opposite side fractured some years previously by a sword wound.

CASE.

Wm. Tomkins, aged 16, of spare habit, on March 16th, while running away from a boy with whom he had been fighting, fell, and pitching upon his elbow, his arm was twisted under him; finding that he had lost the entire use of his limb, he immediately came to Guy's Hospital for relief. Upon examination, the tumefaction being slight, the accident admitted of very easy examination. The internal condyle was found fractured, and drawn upwards and backwards, giving somewhat the appearance of the ulna being dislocated, but the facility of producing a crepitus, readily cleared that point; the olecranon was also found fractured, and the fractured portion was drawn upwards to a considerable extent above the joint, by the action of the triceps muscle; pasteboard splints, and evaporating lotions were applied, the arm placed in a pillow in the semiflexed position, and the antiphlogistic treatment adopted. On the following day, however, swelling and inflammation came on to such a degree, as to render it necessary to remove all the splints, upon doing which, the swelling was found so great, as quite to obscure the nature of the accident, which had yesterday been so perceptible. Sixteen leeches were immediately applied, purgatives, tartarized antimony, and salines prescribed, but which had not immediately the effect of subduing the inflammation, for on the next morning, the local symptoms were even more urgent. The same remedies were again actively followed, when in a few days, the form and size of the limb were sufficiently restored, and at the end of a week, it admitted of being permanently put up.

The question now was, as to the best position in which the limb could be placed, as it is recommended, that the limb should be kept in the semiflexed position for fracture of the condyle, while a perfectly straight one is necessary in fractures of the olecranon; but it occurred to me, that as the internal condyle is under the influence of the triceps muscle, as well as the olecranon, that the extended position would serve equally for both portions of bone, and the limb was put up as for for fracture of the olecranon only. At the end of three weeks, the splints were removed, passive motion gradually employed, and at the end of April, the power of flexing the limb was complete, although he could not extend the joint to its natural degree.

Fracture of the coronoid process of the ulna is an accident of but rare occurrence, it has been described by Sir Astley Cooper, and a preparation of the accident is preserved in the Museum of St. Thomas's Hospital; in which it had, as in cases of fracture of the olecranon, united only by ligament.

The treatment in such cases must obviously differ from that of fracture of the olecranon, in the elbow-joint being maintained in the flexed, instead of the extended position, for the purpose of producing coaptation of the fractured portions of bone.

The following case is an example of this accident, and in corroboration of Sir Astley Cooper's opinion, that no mode of treatment can be adopted by which ossific union can be effected.

CASE.

John Beck, aged 27, was admitted, January 30th, 1833, into Guy's Hospital, with an injury to the elbow-joint, of fifteen weeks standing. He stated that the accident occurred from the kick of a horse, and that the limb was put up by a surgeon, first, in the bent, and then in the straight position, until, at the end of thirteen weeks, finding that he had scarcely any motion in the joint, he applied at Guy's Hospital for relief. Upon examining the limb, I found that nothing further could be done than to increase the degree of motion in the joint, by constant use, and believed, that the nature of the accident was fracture of the ulna, through the coronoid process, separating the shaft of the bone with the coronoid process attached to it from the olecranon, so that the brachialis internus drew upwards and forwards, the shaft of the ulna, upon the fore-part of the internal condyle, forming there a new articulation, while the olecranon process was drawn slightly upwards and backwards, by the action of the triceps; not, however, to any great extent, probably in consequence of a portion of the base of the coronoid process preventing any further separation. The radius was separated from the ulua, and was thrown outwards and backwards, behind the external condyle.

Sir Astley Cooper, who examined this case, gave the same opinion of the accident.

Fractures of both Bones of the Fore-arm.

When fractures of both bones occur, it is usually produced from a heavy weight passing over the arm, or from a violent blow; in either case, the bones are generally fractured on the same level, a circumstance which can scarcely occur, if the accident be produced by a fall, as the radius only in

that case, would receive the whole weight of the body. The diagnosis in this accident may be formed from the following indications; pain, loss of voluntary motion, more particularly as to pronation and supination of the hand, and by a crepitus being perceptible in producing rotatory motion; the fore-arm also presents a rounded appearance, as if tumefied, in consequence of the protrusions of the muscles from the inter-osseal space; there is but little shortening of the limb.

The treatment in these cases, differs in no respect from fracture of one of the bones only; the hand is placed in the position between supination and pronation, and slightly directed towards the ulna, the fore-arm semiflexed, and while a gentle extension, and counter-extension is made, the protruding muscles are te be pushed backwards between the two bones, and to be maintained in that situation, by placing a well adjusted pad on the fore and back part of the arm; over these splints are to be applied, and kept in situation by three or four pieces of tape, or a bandage, taking care that they do not press the broken bones towards each other, and thus diminish the interosseal space. The fore-arm is then to be placed in a sling, but the hand allowed to hang down beyond it, which from its weight materially assists in retaining the fractured ends of the bones in their proper situation. In fact, it is to be remembered, that the grand object is, to preserve the natural extent of the interosseal space, which cannot be permanently diminished without the motions of the radius being rendered imperfect.

In the description of the diagnostic marks, as well as of the treatment of the fractures of the bones of the fore-arm separately, I have so completely detailed all the circumstances connected with fracture of both bones, that it would be useless to recapitulate, by giving an account of the cases which have come under my notice. I may say, however, that I have not once been obliged to amputate from fracture of the bones of the fore-arm; and I believe, that with common care, they are cases sure to be restored to the

natural uses of the limb. I have, however, in one case, amputated an arm, in consequence of a steam-engine so lacerating all the soft parts and blood-vessels as to preclude the hope of reparation, but the bones did not yield, although they checked the progress of a wheel influenced by an engine of eight horse power.

Injuries to the Bones of the Hands and Feet.

The accidents to which these bones are liable, comparatively but rarely occur, considering that the various functions which these parts have to perform, render them constantly subject to the effects of external violence; yet, again the physiologist can but observe how beautifully nature has ordained, that these organs should be composed of numerous small bones, which are so articulated with each other, that any force which may be applied, is distributed equally to the whole; and their various joints, with the geometrical figure of each bone, prevent the injurious concussion which would otherwise so frequently occur; so that if there be such a degree of violence, as to produce fracture of the bones of this part, it is usually so great, as to destroy the soft parts, comminute several of the bones, and generally render amputation necessary. A gun-shot wound, or the falling of a heavy weight upon the hand, are the usual causes of fracture of these bones, and the first view which the surgeon takes, leads him to consider whether or not the hand can be saved. If he be determined to have recourse to this expedient, the treatment consists in removing the comminuted pieces of bone, and generally in the application of poultices, as the great degree of violence which has produced the accident usually destroys the vitality of the soft parts.

Surgeons have, however, divided the fractures, to which the bones of the hand are liable, into three distinct heads, as they may occur either to the carpus, metacarpus, or phalanges.

Fractures of the Bones of the Carpus.

These bones, from their smallness and mode of articulation, when fractured, admit of the adoption of no surgical means to retain their broken portions in position, and all that can be done, is, by local applications and constitutional means, to obviate the degree of inflammation, which must necessarily be set up by the force sufficient to produce so severe an injury. Amputation, indeed, is usually the sequel of such accidents.

Fractures of the Bones of the Metacarpus.

An accident much more frequently occurring, than to the carpus, in consequence of their length preponderating so much beyond their breadth, and thickness; and it is not uncommon for patients to apply to our Hospital for admission, under these accidents. A metacarpal bone is not unfrequently broken by pugilists; and those supporting the fore and middle fingers, are, from their projecting beyond the rest, most liable to solution of continuity; the broken extremities of the bone are usually drawn forwards into the palm of the hand by the interossei muscles, but the metacarpal bone of the little finger, from the action of the extensor carpi ulnaris, the force of which seems to preponderate beyond the flexor, draws the upper fractured extremity backwards.

The treatment in fractures of the metacarpus is somewhat difficult, more especially of the fore and little fingers, both of which have a greater tendency to be displaced than the other two metacarpal bones; it consists, however, in the application of compress and splint being made to act upon the projecting extremity, which is always in the circumference of the bone, and not in the longitudinal direction. If the fracture has occurred to the metacarpal bone of either the middle or ring fingers, the treatment consists in placing a ball in the palm of the hand, and drawing the fingers tightly over its surface, where they should be retained by bandages. I must say, however, that we rarely succeed in producing

such a coaptation, after these accidents, as not to leave some slight degree of deformity.

Fractures of the Phalanges.

This accident does not very frequently occur, both from the smallness, as well as the great mobility of these bones, and the degree of force necessary to produce such an injury, generally comminutes the bone, destroys the soft parts, and renders the removal of the finger necessary. This fact is more particularly applicable to the extreme phalanx, which not only being the smallest, but also having connected with it, the ungual gland, renders the process of reparation, tedious, uncertain, and dangerous, so that amputation is almost always necessary. In fractures of the phalanges, the broken extremities of the bones are drawn forwards, and slightly outwards, by the action of the flexor muscles; the deformity of the injured finger, the unnatural mobility of the bone, and the distinct crepitation, render at once, the nature of the accident obvious.

The treatment consists in extending the finger, in the application of pasteboard splints confined with rollers, and the hand being carried in a sling. I will now relate a case or two in illustration of these principles.

CASE.

Fractured Metacarpal Bone.

Thomas Williams, aged 23, applied at Guy's Hospital, April, 1833, having fractured the metacarpal bone, supporting the little finger of the right hand, by striking a violent blow. Upon examination, the deformity at once formed an easy diagnosis of the nature of the accident, the upper fractured portion being drawn backwards and outwards; the coaptation was produced with but little difficulty by extension and counter-extension, and by pressure on the bone forwards and inwards; nor was there any difficulty in retaining them in their natural position, by the application of compresses and splints; the bone firmly united in about a month.

CASE.

William Shelly, aged 21, applied at Guy's Hospital, March 14, 1833, having fractured the metacarpal bone of the little finger of the right hand nearly in its centre. The injury was produced by a blow whilst fighting; the broken extremities projected considerably backwards, with some slight degree of obliquity outwards. The fracture was adjusted by the application of two splints, one on the dorsal, the other on the palmar surface; and under the former, a compress was placed immediately over the prominent portions of bone; but there was some difficulty in maintaining them in that position. It, however, united perfectly in four weeks, leaving some slight deformity.

I attended a pugilist who had fractured the metacarpal bone of the middle finger from striking a violent blow, in whom the projection formed by the fractured extremity of the bone was towards the palm, as most frequently occurs to the two middle metacarpal bones, from the influence of the interosseal muscles. The treatment in this case consisted in placing a ball in the palm of the hand, as described in speaking generally of the treatment of these fractures. From my experience in these cases I should say that it takes from a month to five weeks for the perfect consolidation of these bones.

CASE.

Fracture of the Phalanges.

James Thompson, aged 47, applied at the surgery of Guy's Hospital, on March 20th, 1833, with simple tranverse fracture of the last phalanx of the fore finger of the right hand, occasioned by its being jammed between two pieces of timber; there was scarcely any displacement, but the crepitus was most distinct; there being little or no swelling, strapping was firmly applied over the whole finger; wetted pasteboard splints were then placed, one on the dorsal, and another on the palmar aspect of the finger, and strapping being applied over these, a roller confined the whole. These applications were taken off at the end of three weeks, when it was found united.

CASE.

Compound Fracture of the last Phalanx.

John Dye, aged 47, applied at Guy's Hospital, June 7th, 1833, with a compound comminuted fracture of the last phalanx of the fore finger of the right hand. He described the accident to have occurred from a cask falling a considerable height, and the edge of one of its iron hoops having struck his finger, completely smashed the last phalanx, and by the laceration of soft parts the fracture was rendered compound posteriorly; sufficient integument, however, was left upon the palmar aspect of the finger to form a flap from that part, so that the dresser immediately recommended the removal of the injured phalanx, to which the patient readily consented, and the operation was immediately performed. The patient would not remain in the Hospital but went out to follow his usual occupations, which brought on inflammation of an erysipelatous character; this, however, yielded to the usual remedies.

In almost all cases of severe injury to the extreme phalanx of the fingers, it is better at once to amputate than to leave to nature the reparation of a part, which, from the particular structures connected with it, is slow and difficult, and even if successful, can hardly occur without anchylosis of its articulation with the second phalanx.

CASE.

John Hooker, a sailor boy, aged 16, applied at the Hospital on the 17th of March, 1833, in consequence of an injury which he had received from a large coal falling upon his hand. Upon examination it was found that there was a comminuted fracture of the last phalanx of the fore-finger, extensive laceration of the soft parts and the joint between it, and the second phalanx laid open; the dresser at once saw the necessity of the removal of this phalanx; but as the laceration of the soft parts extended above the articulation, he deemed it necessary to remove the inferior extremity of the second phalanx, forming a flap, from the anterior and posterior surfaces, and sawing through the bone. The wound healed perfectly in a fortnight, and the boy retained the motion of the second upon the first phalanx: the insertion of the flexor sublimis muscle remaining uninjured.

The following case illustrates how severe accidents to the hand attended with complicated injury to several bones,

render amputation necessary; nor can this produce surprise, if we contemplate the organization of the hand, which is rendered capable of performing its various functions by the assemblage of so many bones, that even a concentrated force will expose several to its influence.

CASE.

William Foskett, aged 72, was admitted on the 5th of April, 1333, into Guy's Hospital, in consequence of a severe injury he had sustained by his hand being crushed between the handle and body of an iron roller, on the preceding evening.

Upon examination of the injured limb, a great laceration of the soft parts on the back of the hand was found, extending obliquely across from without to within; there was also a deep laceration on the palm, but of less extent. On closer investigation, the metacarpal bones of the middle and fore fingers were found fractured, about their centres, but not comminuted; the upper fractured extremities of both were drawn considerably outwards, and more especially that of the fore-finger. The metacarpal bones of the little and ring fingers were dislocated from the unciform bone, their carpal extremities being thrown outwards and backwards; there was also a considerable hæmorrhage which had continued more or less from the time of the accident.

I saw the patient shortly after his admission; and having ascertained the extent of the injury and taking the following view of the case, I recommended immediate amputation of the limb, first, from the age of the patient I considered there could be but very slight hopes of the reparation of so severe an injury, and that even if the bones united and the laceration of the soft parts healed, the hand could never be restored to a useful purpose. This I explained to the patient, who immediately consented to the loss of his hand, which I removed in the following way, by amputating through the wrist-joint; placing the thumb and fore-finger of my left hand upon the extremities of the styloid processes of the radius and the ulna, and proning the patient's hand, I commenced an incision with a short catling upon a plane anterior, or (palmad) to the styloid process of the ulna, and continued it in a crescentic form, so as to terminate at a corresponding point with the styloid process of the radius. This incision was made through the skin and cellular membrane only, not yet dividing any of the extensor tendons, the flap was then dissected back, and the extensor tendons divided upon a plane with the connecting base of the flap, thus entirely preventing their protrusion. The patient's hand was then supined and the corresponding flap made anteriorly; the flexor tendons were then divided in a similar manner to the extensors; the flaps were

now held back by an assistant, and grasping the patient's hand, holding it between pronation and supination and pressing the hand inwards or (ulnad,) I divided the external lateral ligament, thus opening the wrist-joint, continued the knife onwards so as to divide the anterior and posterior ligaments, and by the division of the internal lateral ligament I removed the hand.

The description of this operation occupies a much longer time than its performance, as the operation is in itself so perfectly easy. Three arterial branches were afterwards secured; the ulna branch was so ossified as to produce a crepitating noise when seized by the forceps. The edges of the flaps were now brought together, and secured by sutures and adhesive plaster; a roller was applied along the whole of the fore-arm. The only precautionary remark which I have to make, with respect to this operation, is to avoid the commencement of the incisions for the flap, being directly opposite the extremities of the styloid processes, as in that case, there would be danger of these projecting portions of bone preventing the union of the edges of the flaps.

On the 6th.—The stump was very easy, and free from unnatural heat; the tongue was slightly furred, but moist; the skin of a natural temperature; the bowels had not been relieved since his admission into the Hospital; was ordered some house medicine; and four hours after, as it had not operated, he took some castor oil, which, in a short time, had the desired effect.

7th.—Complains to-day of the stump being rather uneasy. The bandage was therefore removed, when a slight erysipelatous blush was visible, to which he was ordered to apply the white-wash. Tongue rather furred, but moist; skin natural; pulse full, but very compressible; ordered saline medicine, with Battley's solution of opium.

8th.—Erysipelas diminished; stump less painful; bowels moderately open; skin natural; tongue cleaner; pergat.

9th.—Erysipelatous blush rather increased, and there is now some slight degree of swelling of the fore-arm; does not, however, complain of pain, but says he slept very well last night. Ordered a poultice to the stump, which was dressed in the course of the afternoon, when it appears as if about to unite by the adhesive process.

10th.—No change in any symptom.

11th.—The stump was again dressed to-day, when it had put on quite a different appearance; the edges of the wound looking sloughy, without any apparent attempt at adhesion; the erysipelas however, is much diminished; says he has no pain in the stump; slept very well last night; bowels open; tongue and skin natural; pulse rather languid. Was ordered a little fish for dinner, and some porter. Rept: mist: salin: c: opio.

13th.—Upon dressing the stump this morning, it was found that it was nearly in a state of sphacelus; the dressings were therefore discontinued, with the exception of a circular strap placed above the carpus, to keep the flaps forward; and a stale beer ground poultice was applied immediately. He did not complain of pain; his bowels were open; tongue slightly furred, but moist; skin natural; pulse still languid. Ordered four ounces of wine daily; to continue the porter, and to take a draught, twice a day, of ammonia and bark.

19th.—The surface of the stump is now granulating and looks healthy; the palmar flap having entirely sloughed away. The patient seems very well, in general health, and was ordered to continue his tonic medicines and generous diet.

22nd.—The stump improving, granulating rapidly, gains strength daily, and might be described to be in a state of convalescence, if the stump were perfectly cicatrized.

Under all circumstances, I believe the flaps made in this operation, and more particularly the palmar one, must always have a great tendency to slough, in consequence of the little subcutaneous tissue which remains attached to the skin, especially in working people, from the thickness and hardness of the cuticle; hence it is adviseable to make the principal part of your flap from the dorsal surface. In this particular case, the age of the patient, the degree of contusion of the soft parts, and the ossification of his arteries, all tended to diminish the chance of adhesive reparation.

It was curious to watch the process of granulation, which was the mode of cure in this case; the cartilaginous extremity of the radius and under surface of the inter articular cartilage could be seen gradually absorbing, presenting a honey-comb appearance, then softening into a pulpy mass, and ultimately rising into healthy granulation, proving that the process of reparation in all structures is the same, but the progress in cartilage more protracted than in softer structures, although much less so than in bone.

This process of reparation rather differs from the views John Hunter took of the healing of a wound which presented a cartilaginous surface, who says, when cartilage is exposed, it does not exfoliate like bone, nor do granulations arise from it, but that granulations spring from the circumjacent soft parts, and shoot over the cartilage, so as completely to cover, without adhering to it. In this case such a progress could not take place, as there were not sufficient surrounding soft parts for the granulation to arise from.

The result of this case had led me to doubt, whether the patient would not have sooner recovered, and had an equally useful arm, had I amputated in the fleshy part of the limb; and I should say, that in old age, where there is laceration of the soft parts, that the latter operation is the one to be recommended.

Injuries of the Foot.

In an anatomical and physiological view, the injuries to this organ bear a strong resemblance to those of the hand; the grand distinction, however, being, that the injury is usually inflicted on the foot by some great weight falling or passing over it, while the accidents to the hand more frequently occur from the application of one's own muscular force, particularly so far as refers to the injuries of the metacarpal bones; perhaps it may be said, in consequence of the comparative greater strength of the foot, that severe injuries more frequently lead to the necessity of amputation, than even in the hand, as it requires a greater degree of force to produce a similar injury. The constitutional and mechanical means for their treatment are so similar, that I shall not detail the cases which have occurred, but merely mention that most of them have been complicated with severe injuries to the ankle-joint, evidently rendering the immediate amputation of the leg necessary.

In one case, however, I removed the metatarsal bone of the great toe from the os naviculare, in consequence of the subsequent effects of an accident; but of these partial amputations, whether of the hand or foot, no usual plan can be adopted, even from the most precise surgical principles; as the age and general health of the patient, and extent of injury to the osseous, and soft structures, particularly including the state of the blood-vessels, must lead, to the propriety either of attempting to save, or at once remove the whole of the organ, or the part merely injured. The great toe should always be attempted to be saved, as its loss is so irreparable to the patient. In progression, it

forms the concentrated point, to the muscular power of the one limb, as the great toe of the advanced foot receives the weight of the body in the completion of a step; hence I say, that a surgeon should not leave a single attempt untried to save so important a part.

Fractures of the os Calcis.

The os calcis requires some few remarks distinct from the fractures of the rest of the bones of the foot. It is said, that this bone may be broken from the contraction of the muscles only, although it may also occur from the application of some external force. Boyer cites examples of such cases, resulting from both of these causes. My friend Mr. Professor Green, related to me a case of a lady who fractured her os calcis, merely from missing a stair, which accident Mr. Green attributed entirely to the influence of the gastrocnemii muscles. I have never seen this injury, unless complicated with such severe hurt to the rest of the foot, as to render amputation necessary; the pain immediately following this accident, the inability to extend the foot, and when forced into that position, the distinctness of crepitation, render the diagnosis sufficiently obvious.

The treatment of this case, is self-evident, and similar to that in rupture of the tendo Achillis, namely, permanent extension of the foot, to produce coaptation of the fractured portions; it, however, also requires the application of some apparatus to produce a degree of pressure, from behind to before, in the long axis of the foot, so as to keep the fractured portions in perfect apposition; but even with strict attention to all these means, I should consider the prognosis unfavourable, if the fractured portions were widely separated, indicating laceration of the periosteum of the calcis; as then, the portion attached to the tendo Achillis is so insulated as to lose all its supply of blood but from the tendon, which seems but little fitted to lead to ossific deposition, and ligamentous union only can be expected. This accident, therefore, resembles in a great degree,

fractures of the neck of the thigh-bone, of the olecranon and coracoid processes of the ulna, of the acromion process of the scapula, and of the patella.

Fractures of the Patella.

When treating of the accidents to this bone, it offers peculiarities rendering it different from every other bone in the body. As far as refers to its particular use in altering the angle of action of the muscles whose tendons surround it, it is similar to the other sesamoid bones; but from its comparative greater size, and being frequently the subject of fracture, it stands alone, when considering the treatment of injuries to the sesamoid bones.

The patella may be fractured transversely, or with different degrees of obliquity; the longitudinal fracture, however, but rarely occurs, and this is explicable from the solution of continuity of this bone most frequently happening from a sudden and violent action of the extensor muscles. But the patella has another office to perform, besides that of directing the concentrated force of the extensor muscles to the tibia; it has also in many positions of the body, as in kneeling, to protect the knee-joint from injury, so that in falling, it frequently is driven with great force to the ground, and rendered liable to an oblique or longitudinal fracture. It sometimes occurs, that the ligament of the patella, or the tendinous insertions of the muscles into it, give way, rather than the bone itself: *a priori* it might be supposed that such would be the most frequent accident, but the slight degree of extensibility of these parts, compared to the brittleness of bone, renders the latter more frequently the subject of injury. When the patella is broken transversely by the action of muscles, the most frequent cause of this violent action is well explained by Boyer, whom I shall quote. "To form a correct idea of the manner in which the fractures of the patella take place from the action of muscles, it should be remembered, that the erect position is the firmest possible, when the centre of gravity is in a line perpendicular to the base on which

the body is supported; it also happens, that although the line of gravity may cease to be perpendicular, that still by the action of muscles the erect posture may be maintained. If the centre of gravity be suddenly thrown from the perpendicular, (and we will suppose in a direction behind the base,) as suddenly, and with a force proportionable to that which renders the action necessary, must the extensor muscles of the leg act, so as to bring the trunk forwards, and restore the centre of gravity to the perpendicular; it is under this sudden and violent impulse that the bone usually gives way transversely. Thus a person riding behind a carriage, and jumping off with his back towards the vehicle, has a tendency to be thrown backwards by the vis inertiæ of his body, when by the violent contraction of the extensor muscles of his leg the accident occurs."

The diagnostic mark of the transverse fracture of the patella is sufficiently easy. Immediately upon the infliction of the injury, the patient has lost all power of advancing the foot of the injured side, and if he has fallen, which he will necessarily do by attempting to walk unsupported, he is perfectly unable to rise without assistance; but he can without aid, progress with a retrograde motion by drawing the soles of his feet along the ground, at the same time taking care not to bend his knees. Upon examination also, it will be found that the upper portion of the fractured bone is separated from the lower, at a distance, proportionate to the laceration of the capsular ligament and tendinous aponeurosis covering the bone, so that it may differ in extent, from half an inch to four inches and a half. There will also be found in the front of the knee-joint, a depression instead of the natural prominence of the patella, and by a very slight degree of pressure the hand seems as if it would sink into the joint; and further, by most perfect extension of the leg upon the thigh, and at the same time flexing the thigh upon the pelvis, the detached portion of the patella may be brought down to that fixed to the ligamentum patellæ, and a crepitus be readily felt. Such are the diagnostic

marks; and in cases of simple fracture the prognosis is favourable, although the appearance of the joint would lead an unaccustomed eye to the suspicion of extensive injury, in consequence of the degree of swelling caused by the effusion of blood, and the inordinate secretion of synovia, arising from the consequent inflammation.

Although I have described the prognosis as favourable, I mean so in reference to the constitutional symptoms and preservation of the limb; but as far as refers to the joint itself, the perfect restoration of its function is not to be expected, as ossific consolidation of a transverse fracture of the patella never takes place. This fact, may be maintained by the experience gained from the numerous opportunities which offer themselves of the examination of the living, as well as by dissection after death; still, however, the object is the same as in other fractures, to employ such means as will not only produce perfect coaptation, but in the best manner maintain the bones in position.

The treatment, therefore, consists in the most perfect extension of the leg upon the thigh, and flexion of the thigh upon the pelvis, so that the limb is placed at an angle of thirty degrees, with the horizontal line of the trunk; or the patient's body may be raised to the sitting posture, which will equally relax the rectus muscle. The extensor muscles are now to be gently drawn down by the surgeon's hand, and a bandage rolled around the thigh, for the purpose of giving them support and diminishing their irritability, and thus fix the upper portion of the patella. This bandage may then be continued from the thigh to the leg, and from the leg back again to the thigh, passing behind the knee-joint, so as to cross one another in the ham for several turns, in the form of the figure of eight, thus embracing the sides of the patella; it may then be continued to the foot as a common roller to prevent the swelling which would otherwise occur from the partial compression. A circular strap should be buckled on above, and another below the fractured patella, and these made to approximate by means

of side straps; a long hollow splint, well padded, so as to produce equable pressure on every part, should reach from the ischium to the heel; and this apparatus being well adjusted, every motion of the knee-joint is entirely prevented. As to the constitutional and local remedies which are to be adopted, they must be regulated by the urgency of the symptoms which arise; if much inflammation of the joint supervenes, leeches and fomentations must be employed; all pressure of the limb by bandages relieved, and evaporating lotions kept constantly applied. If the constitution becomes affected, indicated by irritative fever, white tongue, quick pulse, and heated skin, saline medicines, with calomel and opium, will be found the best means to be employed. Such symptoms rarely occur, unless the fracture be compound; under which circumstances, however, the treatment will in no way differ from what has been described, unless the injury be so severe as to render amputation necessary; in which case, the surgeon must quickly decide, as it will be too late if violent inflammation once commences in the knee-joint.

There is no subject in surgery which requires more professional knowledge, founded upon experience, than in very severe accidents to the knee-joint, such as from gun-shot wounds, or contusions from great weights, to decide upon the necessity of immediate amputation; for if the moment be allowed to pass, when the constitutional effects of the injury take place, it is generally too late, and the patient falls a victim to an accident, from the ill effects of which, a judiciously prompt surgeon would have saved his patient by the removal of the exciting cause. I have heard surgeons say, wait until suppuration begins, we can then but amputate;—seeming to forget, that suppuration is generally the effect of a degree of inflammatory action, from which the constitution usually receives so severe a shock, as to render it but little capable of sustaining the severity of an operation. Therefore, I should recommend after all severe accidents, when the surgeon considers amputation necessary,

that he should perform the operation as soon as the patient has recovered from the collapse, which may have been produced by the severity of the injury; with the conviction that the constitution would better bear this second shock, than when under the influence of the ineffectual attempts of nature at reparation.

In simple fracture of the patella after the apparatus has been applied from five to six weeks at the longest, passive motion should be commenced in the knee-joint, and should be increased gradually more and more every day, until the perfect flexion of the limb be restored.

In oblique, or longitudinal fractures of the patella, the same treatment is required, as in the transverse, at least, if the obliquity be sufficient to permit of the separation of the two fractured portions; but if it be perpendicular, there need be no separation of the two portions of the bone, and possibly, no other immediate symptom than the pain produced by the infliction of the blow, so that the diagnosis would be extremely difficult, and the nature of the accident probably never detected, but treated as mere contusion. According to the experiments made by Sir Astley Cooper, on the lower animals, when a perpendicular fracture was made through the patella, it was found that it united by bone; so also in transverse fractures, when they were so produced, that neither the tendinous expansion on the bone or the capsular ligament were torn through, and consequently, that the fractured portions were not separated, ossific consolidation occurred; thus placing the pathology of fracture of the patella under precisely the same circumstances as that of fracture of the neck of the thigh-bone.

After a surgeon has treated a case of fractured patella, he should warn the patient of his liability to fracture the other, in consequence of the loss of equal power in the extension of the two limbs, so that in walking, the foot of the injured side is liable to catch against the ground, throw the patient on the opposite knee, and thus produce a similar accident.

CASE.

Samuel Blackmore, aged 36, was admitted May 20th, 1833, into Accident ward, in consequence of an injury he had received from having fallen a height of fourteen feet, immediately upon his knee. He described that he had not injured himself in any other part of the body, but that still he was unable to rise, and that when by the assistance of others he was lifted up, he was totally incapable of progressive motion. At the time of his admission, he complained of intense pain of the injured knee, and indeed of the whole left extremity upon the slightest motion; and the necessary examination of the joint to ascertain the extent of injury, gave him excruciating pain. The whole joint was much swollen, particularly opposite to the situation of the patella, but on placing the fingers with the slightest pressure on this prominence, they sunk readily down into an oblique fissure, admitting of a separation to about the extent of the breadth of a penny-piece. Thirty leeches were immediately ordered to be applied, the evaporating lotion to be kept constantly on the part, and aperient medicines administered. The limb was placed upon a long splint, furnished with a foot-piece, which was raised to an angle of about twenty-five degrees from the horizontal line of his body; this position effectually relaxing the extensors of the leg, and being, as by experience we find, an easier position than the half sitting posture, which however, produces the same effect. In about a week, the swelling entirely subsided, and the oblique fissure could be distinctly felt, rather below the centre of the bone. There was so little separation in this case, that he was allowed at the end of three weeks to get out of bed, and walk with the use of crutches, but in using too much exertion, he brought on some inflammatory action, which rendered cupping and purging necessary to reduce it. He ultimately got perfectly well, and it required a minutes examination to discover where the fracture had occurred.

This close union depends upon the circumstance of the tendinous covering of the extensor muscles, and the capsular ligament of the patella, not being torn through, so that there is no difficulty in producing coaptation of the fractured extremities, or of maintaining them in that position. Still, however, I have a doubt, whether even in these cases, the union occurs by ossific consolidation; for I have had two patellæ to examine, in which bony union seemed to have occurred, when upon maceration but for a short time, motion was permitted between the two portions, and a ligamentous

union proved to be the means of reparation. The spongy texture of the patella, the large articular cartilaginous surface which it presents, its tendinous covering, its subjection to the influence of powerful muscles, and, when fractured, its insulated position, as well as the late period at which it naturally becomes ossified, are all circumstances which point out the difficulty of ossific deposition in this bone. And further, its physiology would lead one to believe that earthy deposition in this bone would readily endanger the whole motions of the knee-joint; more particularly, when we remember that on its articular surface it has no periosteum to limit the extent of ossification. The treatment, however, is the same as if bony union were expected; for the object here is to produce as short a ligamentous union as possible, so that this great sesamoid bone may still remain under the natural influence of the extensor muscles of the leg.

I shall only describe one other case of fractured patella, and that only, because its solution of continuity was the result wholly of muscular action.

CASE.

James Thompson, aged 26, admitted June 30th, into Guy's Hospital, in consequence of a fracture of his patella, which had happened under the following circumstances. In jumping from one barge to another, which were some distance apart, he was nearly falling backwards, when to save himself he put his extensor muscles of the legs into violent action to draw the trunk forwards, and probably from the peculiar position of the left leg, the degree of force was unequally distributed, and the left patella gave way. He immediately fell into the barge, and was unable to rise without assistance, and when raised, could not advance the foot of the injured limb.

Upon his admission into the Hospital, an hour after the accident, there was as yet but little tumefaction, although the fractured portions of bone were separated to nearly two inches, but it was evident that the swelling was increasing rapidly. Twenty-five leeches were ordered to to be applied immediately, and warm fomentations to encourage the bleeding, the limb was placed precisely in the same position as described in the last case, but the degree of the ligamentous union of the fractured portions was, as might be supposed from the much greater degree of their separation, of greater extent.

It rarely happens that any difficulty arises in producing a reparation after accidents of this kind; so that the two cases I have described, may be deemed sufficient to illustrate the advantage of the practical application of the means to be employed under these accidents. I have, however, met with one case in private of a perpendicular fracture of the patella, which was produced by a fall on the part, by being thrown from a horse; and in which the union is so perfect that it is now impossible to detect the precise situation of the fracture. Still I would be inclined to doubt whether the reunion is produced by bone, although it may ultimately be so; I should consider, as indeed is proved, that the reproduction must inevitably be slow, where the original formation was itself so tardy. The close adaptation, results merely from the muscles not influencing fracture in a perpendicular direction.

DISEASES OF JOINTS.

Before I begin to describe the diseases to which the joints are liable, and their effects upon the constitution generally, it will be necessary, first, to consider the many different structures which enter into their composition, that we may be enabled to take a correct view of the different functions each part has to perform for the perfection of the whole; and by which alone, we can perfectly comprehend the diagnostic marks, indicative of the peculiar structures affected in the diseases of joints.

By an articulation or joint, is meant the union of one or more bones through the intervention of other tissues, enabling them to permit a degree of motion suitable to the function each class of bones has to perform; and without such structures, the osseous system could not be influenced by the muscular, to perform the motions essential to the organismus. Motion, then, is the function of an articulation; but as the extent, the direction, and the application of the force to produce it, differ in the different joints in the body, the Anatomist, the Physiologist, and Pathologist, have all agreed in the propriety of dividing them, into three different classes; as the moveable or diarthrodial, the immoveable or synarthrodial, and the mixed or amphiarthrodial joint. It is the first of these, namely, the diarthrodial class, which principally occupy the attention of the surgeon; for in proportion to their motion, so do various structures enter into their composition, so are they under the influence of powerful muscles, and so are they subjected to accidents and disease. I may mention, however, here, that both the synarthrodial, and amphiarthrodial joints, are constantly undergoing changes, suiting themselves to the different epochs of life; as in infancy, the adult, and old age: this may well

enough be illustrated, by bringing to the recollection the synarthrodial articulation of the teeth, forming that peculiar joint which is called gomphosis, which during infancy passes through the phenomena of cutting and shedding; during the adult age acquires a firmness rendering them capable of obeying the influence of the strong masticating muscles; and in old age undergoes that change, that natural process of decay, which indicates this advanced period of life. The diseases of these joints, and of other structures consequently affected, are now-a-days considered almost as a science of itself; and of the many works written upon the subject, there is none which I have read with more satisfaction, because from none have I derived so much information, as that published by Mr. Thomas Bell, whom I have the pleasure to call my colleague.

In the changes which are constantly occurring in the amphiarthrodial articulations, the consolidation of the ossa innominata, the loss of elasticity and flexibility in the fibro-cartilages which unite the bones, as well as the anchyloses which sometimes occur, all indicate their natural changes, and their liability to disease. Into the composition of a diarthrodial joint there enters, bone, to give solidity and form, as well to suit the joint to its peculiar motions, as to present an extended surface to prevent displacement. These articular portions of long bones are placed at their extremities, and until the age of puberty, a line of demarcation, in which the animal matter of bone so essentially preponderates, separates them from the shaft of the bone; they are spongy in their texture, so as to diminish the degree of weight, which would otherwise, from their size, render them too heavy for the use for which they are intended, and their articulatory extremities are tipped with cartilage. There are no portions of the long bones so liable to disease as these articulatory extremities; and it is obvious at once, how rapidly the joint must become affected, if the disease is not readily overcome; hence it is, that young people, with that peculiar

diathesis indicative of scrofula, are so frequently the subject of joint diseases. As I have before mentioned, bones as frequently deviate from their healthy state, as the soft parts, and indeed are constantly undergoing changes during the different periods of life, the slightest deviation from the natural course of which, induces a diseased action; and as one of the most important changes in the long bones, is the consolidation of the epiphyses, it not unfrequently happens, that during that process, a diseased action is set up, perhaps from some mechanical, but generally from some constitutional cause. Hence it is, that we frequently find deviations from the proper conformation of bone, which constitute what has been termed, when the whole circumference of the bone becomes enlarged, hyperostosis; or when the enlargement projects but from a small part of the bone, is then termed exostosis, and such diseases may interfere with the motions of the joint.

Inflammation either of a common, specific, or malignant character, also attacks bone, and produces effects frequently destructive to joints; if this inflammation commences in the periosteum, as I believe it almost invariably does, it goes on in the same process as inflammation of soft parts, to terminate in what is termed resolution, by which is meant, the adhesive inflammation; in this case a fluid is poured out between the periosteum, and the bone; this becomes converted into cartilage, and from cartilage into bone, producing what is termed a node, and which need not be, as is usually supposed, the effect of syphylis. When such a disease attacks the articular extremities of bones, there is that permanent enlargement about the joints, which is so frequently seen in scrofulous constitutions; but this inflammation of the periosteum may go on to its destruction, by ulceration; when this is the case, the corresponding portion of the bone is deprived of its nutrition, and dies; at the same time the internal, or medullary membrane inflames, the cancellated structure of the bone granulates, the dead surface becomes separated from the living, and a process of separation is immediately set up,

producing what is termed exfoliation. If the portion of compact bone thus destroyed, be to any great extent, it is not all thrown off at once, but the granulations from the cancellated structure are thrown out beyond the edges of the dead bone; they become connected with the surrounding soft parts, a new periosteum is formed, and then the granulations secrete a new bone, which surrounds the dead portion, thus establishing the disease which is termed necrosis. Nature seems to have wisely ordained this process, when so large a portion of bone is diseased as to render it incapable of sustaining the action of the muscles, so that, by the processes of reparation and disease going on together, the grand characteristic of bone, solidity, is still maintained. In the formation of this new bone, nature has provided that it should not form one continuous case to the old sequestrum, but that openings should be left for its exfoliation; thus providing bone sufficient for strength, and yet so arranged, as not to prevent the separation of the dead matter.

I have mentioned the affections of bone, under the head of diseases of joints, because they are so frequently depending upon each other; and although exfoliation and necrosis do not frequently attack the articulatory extremities of bones, (as it may be learnt from the circumstance that these diseases almost invariably terminate at the epiphyses,) still, I did not think it right to describe the affections of those parts of bone entering into joints, without hinting at the diseases of the osseous system generally.

The result of inflammation, in the articular extremities of the bones, in consequence of their more spongy texture, of their greater quantity of animal matter, and of their consequent greater degree of vitality, is, their liability to pass into suppuration, producing extensive abscesses in their substance, or that disease termed spina ventosa. Sometimes, however, the suppurative process is not confined to the bone, the soft parts around the joint ulcerate, and small spiculæ of softened bone are thrown off, producing that peculiar disease, which is termed caries; so that I should

say, caries of the spongy parts of bone, is the same disease as exfoliation of their harder structure.

When the articular extremity of bone becomes affected, it is indicated by a deep obtuse pain, more particularly aggravated by heat in bed, and attended with intolerance to motion, or to bear weight upon the limb, the sensation advancing, perhaps, to constant uneasiness. The pain then becomes more acute, with an occasional sensation of chilliness, which soon increases to rigor; the soft parts about the joint next begin to swell, the skin to inflame, and the tumour to fluctuate; this is sufficient evidence of the formation of matter within the bone. The great object now must be to use every means, both local and constitutional, to prevent the disease extending into the joint, which, however, it will be found nature has already in some measure, affected; for, in consequence of the cartilage, and ligaments having so little vitality, and the synovial membrane so slight a tendency either to the ulcerative or suppurative inflammation, pus has always a direction towards the exterior, and frequently in what are termed extensive abscesses of a joint, the articulation itself is free from disease. In a diseased joint, the slightest pressure will aggravate the morbid sensations of the bone; while the action of its muscles, the twisting of its ligaments, and the pressure of its cartilage produce pain, indicating that the integrity of these structures, are, more or less, subservient to the osseous part of the articulation; all this shewing, therefore, the necessity of perfect rest, and the administration of such internal remedies, as may be considered appropriate to the peculiarities of the case. Small doses of mercury, with opium, and general alterative medicines, with tonics, are commonly the constitutional means to be employed; while the opening of abscesses, assisting in the removal of the carious bone, and a splint to keep the joint at perfect rest, are the best means to prevent the other structures of the joint becoming involved in the disease. But all these means sometimes fail, the articular cartilage becomes separated from the

diseased bone, softens, ulcerates, and becomes absorbed; the synovial membrane is subsequently destroyed, and matter makes its way into the interior of the joint; the disease extends to the other bones of the articulation, the same process takes place, but in the reverse order,—its synovial membrane being first affected, then the cartilage, and consequently the bone; the case then terminates by the certain destruction of the joint, frequently leading to the necessity of its amputation, but sometimes terminating in consolidation, which is termed anchylosis. Thus we see that the disease of the bony part of the joint only, may subsequently destroy its numerous structures; but as the converse is not unfrequently the case, the diseases of the other structures must be individually described.

Of Cartilage.

The physical properties of cartilage alone would point out the peculiar use for which it is intended, elasticity being its great characteristic; in appearance, it presents a solid polished substance of a pearly whiteness, softer and lighter than bone, and slightly flexible. In texture, cartilage is fibrous; although the fibres are so closely connected that it rather presents a homogeneous surface, but by ulceration or boiling, they become easily demonstrable.

In a state of health, no blood-vessels can be traced into cartilage; but under disease, or even when naturally excited, as for the production of bone, blood-vessels conveying red particles, become visible; but that redness, which appears on the surface of cartilage during maceration, is considered by Rudolphi as blood, as he found it more abundant in the young, than in the adult cartilage, and quite absent in that of old people. Berzelius considers this redness to depend upon an oxide of iron existing in it. Cartilage, like bone, is composed of animal matter and phosphate of lime, but the proportions are very different; adult cartilage containing only five parts out of a hundred of phosphate of lime. This system is found in different parts of the body, but much

more abundant in infancy than in after periods of life; hence they have been divided into temporary and permanent cartilages. The temporary, principally belong to the osseous system, which is no sooner completed than these cartilages are lost, from their conversion into bone; although they may again appear in different situations in the body, in the process of reparation or accidental growth of bone, for which they are as essential as for the original growth. If temporary cartilages be the subject of inflammation, they have an immediate tendency to ossify; while on the contrary, the permanent cartilages are rarely converted into bone. The permanent cartilages are found in three situations in the animal economy: first, forming important organs, as the trachæa, &c., secondly, lining the depressions of bone which are to facilitate the motions of tendons, and thirdly, entering into the composition of joints. It is the latter kind of which it is now my intention particularly to treat. The development of these articular cartilages, seems to me a subject well worthy of more close enquiry than has hitherto been appropriated to it; for although it is described by all anatomists, that the articulatory surfaces of the long bones are covered with cartilage, yet the manner in which this cartilage is produced, or the apparatus which is necessary to its formation, has never been clearly described. It is evident, however, that the extremity of a bone is not in itself capable of producing permanent cartilage; of this, we have proof in cases of supernumerary articulations, where every structure essential to a joint is reproduced, but articular cartilage.

Let us then examine, what is the difference in the organization of the articulatory extremities of long bones, when we shall find a texture differing from the rest of the bone; they present a larger surface, are more spongy, receive more blood, and from a different source; they also contain more animal matter; their exterior is covered with a proportionable thinner layer of compact bone; and the whole is separated from the shaft of the bone, until the adult period

of life, by cartilage, forming what is termed an epiphysis. All these circumstances seem to indicate a peculiar function, differing from the rest of the bone to which they belong, and probably, the formation of articular cartilage is the special purpose for which they are intended. The free or articular extremity of a long bone deviates from the rest, also, in not being covered by periosteum, and to that has been attributed the absence of the deposition of phosphate of lime on this part; but were the absence of periosteum the only cause of the formation of articular cartilage, we might fairly suppose, that in the injuries to bone, permanent cartilage might be reproduced; while on the contrary, as has been before mentioned, it is one of the few structures of the body which seems never formed anew; hence, therefore, I should further deduce that the epiphysis is the apparatus for the formation of articular cartilage. Another proof that the articular cartilages are formed from the extremities of the bone themselves, is, that the cartilaginous fibres are always vertical to, and continuous with, the long axis of the fibres of the bone to which they are connected, which renders them in the best way fitted to sustain weight and concussion in that direction.

It is scarcely yet a settled point, whether the free or articular surface of these cartilages is covered by synovial membrane, or whether that membrane merely lines the inner surface of the ligaments, and passes from one to the other, so as to form a membranous boundary to an articulation, but not a membranous closed sac, as is generally described. In a healthy joint, no delicacy of manipulation can trace it over the surface of cartilage; but in the morbid changes, to which the synovial membranes are liable, it certainly appears to cover them. In young people, before the age of puberty, cartilage is soft, highly elastic, and seems to possess a degree of vitality proportionably greater than at any other period of life, and is more liable to disease. At the adult period, when the epiphyses are consolidated, the articular cartilages seem completed, in the development of all their physical proper-

ties, and rendered capable of sustaining the matured power of the muscular system; during this adult period, they remain stationary, manifest the slightest degree of vital principle, and appear almost incapable of disease; they may be wounded without producing pain, and when wounded, they are only capable of reunion by the intervention of a ligamentous tissue. In the advance towards old age, cartilage, like other structures of the body, undergoes changes denoting this period of decay; it loses its pearly whiteness, its elasticity diminishes, it hardens almost to dryness, and is no longer capable of maintaining that degree of elasticity, the perfection of which indicates the airy step of youth, as much as its absence is marked by the hesitating and cautious footstep of old age.

When cartilage becomes inflamed, as it may do in a violent injury to a joint, and that injury produces a concussion beyond what the elasticity of cartilage can sustain, it is indicated by a deep pain, which is increased by pressure in the direction of the vertical axis of the joint, although flexion, extension, or lateral motion, are permitted without suffering; this shews, in my opinion, that the exciting cause to disease is the inordinate, violent, and, perhaps, involuntary application of the natural function of the structure. To explain what I mean, I may illustrate it thus:—a violent blow inflames bone, violent concussion cartilage, the twisting of a joint injures ligament, and too extensive a degree of motion of an articulation will inflame tendons, and the synovial capsules. Cartilage thus injured is slow in reparation, hence it is, that severe injuries to joints are a length of time in recovery; it rarely happens, however, that ulceration of cartilage occurs, unless the disease has begun in bone, and then it more frequently sloughs than ulcerates. The permanent cartilages do sometimes exfoliate, but before this can occur they must have been converted into bone, and are then rendered liable to the disease of that system. The most common effect of inflammation on cartilage, is its softening, swelling, and being converted into a gelatinous mass, when, only, it becomes

capable of being absorbed: this state, I am inclined to believe, usually follows diseases of the synovial membrane. The result of the removal of articular cartilage by absorption is the destruction of the joint by anchylosis.

Synovial Membranes.

Of all the structures entering into the composition of joints, synovial membrane is the most frequently affected; and this tendency to inflammation has been attributed to the similarity, if not to the identity between them and the serous membranes. The most common effect of inflammation of synovial membrane, is the inordinate secretion of its fluid, producing that disease termed hydrops articuli. This disease may be known at once, from the degree of swelling, without proportionable pain, constitutional disturbance, or general inconvenience; it is rarely traceable to any exciting cause, although it sometimes attends rheumatism and gout, and often so insidiously does it appear, that it is not uncommon to attribute the accumulation of synovia, as frequently to the diminished power of the absorbents, as to the increased action of the arteries. The treatment of hydrops articuli should be regulated by a strict investigation into the first symptoms pointing out the deviation from health; and if pain be an early symptom, thus indicating that the arterial system was at fault, local bleeding, cold applications, and rest, should be enjoined, before blisters, or any stimulating applications are used; but if on the contrary, the disease has established itself without the patient suffering any inconvenience beyond stiffness of the joint, blisters, tartar emetic ointment, and such medicines and means as stimulate the absorbents should be had recourse to.

If the patient be at the same time the subject of any specific disease, such as rheumatism, gout, or gonorrhœa, then specific remedies should also be administered, besides the local means which have been described. Inflammation of synovial membrane, however, does not invariably lead to hydrops, it will sometimes produce such an alteration of its

tissue, as entirely to destroy all appearance of its original texture; it becomes thickened, red, presenting a villous appearance in its interior, and covered with an albuminous substance, some flakes of which resembling newly formed adhesive matter, will be found floating in the synovial cavity, and others adhering to the inflamed surface of the membrane, by small peduncles. There is reason to believe it is in this way, that cartilages are sometimes formed in the interior of synovial cavities, and the peduncles giving way, they are left loose within the cavity. We have in the Museum of Guy's Hospital, a preparation beautifully illustrating this fact, in which several cartilages are seen adhering to the thickened synovial membrane by their peduncles.

After continued inflammation of the synovial membrane, without its going on either to suppuration or ulceration, it sometimes becomes so thickened upon the articular surfaces of the bones, particularly of the knee-joint, as to interfere with its motions, and to alter the form of the joint; sometimes producing what is termed a soft anchylosis. This thickening, seems to depend upon the organization of the adhesive matter thrown out by the synovial membrane; it occurs usually at the age of puberty, and generally, as the result of repeated attacks of inflammation. Mr. Brodie seems rather to consider it as approaching to a malignant character. This kind of disease is not, however, to be mistaken for the true malignant fungoid disease of joints, in which all the structures entering into their composition become ultimately destroyed; the bone itself is swollen, softened, and inflamed:—this disease invariably terminates in death, even though the limb be amputated. Suppuration of the synovial membrane is very rare, unless concomitant with the disease of the other structures of the joint; this is one argument of the resemblance, between the serous and synovial membranes, namely, that they have a greater tendency to the adhesive, than the suppurative inflammation; it does, however, sometimes occur, and even rapidly—instances of which Mr. Brodie has quoted, where a patient had died a very short time after an injury

to a joint, and where the synovial membrane had ulcerated through. Swelling of the joint, without proportionable inconvenience, some slight degree of stiffness, extending in the course of the muscles, and intolerance to motion, are the diagnostic marks of the inflammation of this membrane. The disease is usually, unless of some specific character, readily checked, and no ill effects result from the attack, where the synovial membrane alone is the subject of the disease; but where the other structures of the joint become implicated, the most alarming consequences result, and the surgeon has to combat with difficulties, equal to any, which the practice of his profession can demand.

Ligaments.

The articular ligaments perform so important a part in the function of joints, that their diseases, although few, require particular description. The use of ligaments, is to limit the motions of a joint in the direction in which mobility is permitted, and to prevent it entirely in every other; they effect this purpose by passing from one bone to another, in the form of strong fibrous bands, which may be distinguished from the other fibrous tissues, by their being composed of firm, inelastic fasciculi, of a metallic lustre, arranged in parallel lines, and strengthened by cross fibres; their texture is usually looser on their external, than their interior surface, where they are lined with synovial membrane. With respect to the organization of ligament, it is but slightly vascular, but is more so than cartilage; still it will be found upon examination, that many of the blood-vessels, which appear at first view as if they were for the purpose of supplying ligament, are in fact distributed to the synovial membranes, or the extremities of the bones. Their nerves are so small as not to admit of being traced into their substance, but the evidence of their existence, must be admitted from the pain produced by spraining a joint, which may be defined a violent tension of the ligaments; when the slightest contortion of the articulation, will immediately produce a peculiar sensation of pain

in those ligaments which are influenced by the motion. In early life, the ligaments are comparatively soft, and more vascular than at the adult period, when tenacity and flexibility are their grand characteristics; in old age they become yellow, less brilliant in appearance, less flexible and dry,—beyond these natural changes, however, this system is but little liable to alter in structure. When inflammation attacks the ligaments, whether caused by accident or disease, unless indeed it be either rheumatism or gout, it rarely puts on an acute form; but encroaches so insidiously, as not unfrequently to have acquired a considerable degree of alteration, before its symptoms are sufficiently urgent to induce the patient to seek medical aid. Swelling is one of the effects of inflammation, but if the articular ligaments only are affected, it is but to a slight extent; when however, the synovial membranes become implicated, tumefaction forms a very prominent feature. By rest, and cold applications, common inflammation is usually readily subdued; but if on the contrary, proper attention be not paid to it at its commencement, and if the inflammatory action be allowed to continue, the ligamentous tissue becomes altered, being softened, converted into a yellowish mass, and rendered incapable of sustaining the common motions of a joint. Sometimes, but very rarely it occurs, that inflammation will produce a hardened and thickened state of the ligaments, even amounting to ossific deposition in them, destroying the flexibility of the articulation. In arthritic inflammation, the ligamentous tissues undergo a peculiar change, having secreted between their fibres, chalky concretions, frequently composed of the cyanate of soda, which will act as an extraneous body, and produce inflammation in the contiguous structures.

When ligaments are torn through, they are capable of reuniting, if the joint be kept in a perfect state of rest, so that the lacerated extremities may be approximated; the agglutination which occurs, is at first more extensible than the primary structure, but it soon acquires by passive motion, its original tenacity. Fungus hematodes generally commences

from the ligamentous tissue; thus we find that the dura mater, the sheaths of muscles, and the periosteum are the frequent seats of fungoid disease. Ulceration or mortification rarely occurs in these structures, although it may subsequently, from the destruction of the surrounding parts. Such are the diseases of the different structures of the moveable articulations, each of them liable to their own affections, which are usually caused by the inordinate employment of their natural function, but each of them also liable, to become secondarily affected by the diseases of one another; hence the necessity of a close investigation into the early symptoms of a diseased joint, so as to learn the structure which was first morbidly affected.

On taking a view of diseased articulations, we are hardly at first aware, according to the common acceptation of "joint disease," what different tissues are affected, and what different results will be produced in these tissues, by the same inflammation. Perhaps, therefore, it will be right to give a general view of the diseases to which joints are liable. Considering the structures collectively, a joint may be said to be subject to common inflammation, which may terminate in the adhesive, suppurative, or ulcerative processes; being also the subject of specific diseases, as scrofula, gout, and rheumatism. External injury is one of the most frequent exciting causes to diseases of joints, and is indicated by swelling, pain, and intolerance to motion; such a case should be immediately treated by local, and, sometimes perhaps, general bleeding, fomentation, rest, and the strict antiphlogistic regimen; great attention should always be paid to an inflamed articulation, as the danger is to be dreaded in proportion to the continuance of the disease. Such treatment, if the inflammation and its effects depend wholly upon the local cause, almost invariably subdues the disease; but if the inflammation be idiopathic, arising spontaneously, or even from external injury, where the subject is of a scrofulous diathesis, the disease is to be considered as more dangerous, and the remedies less certain in their effects; thus we find

scrofulous affections of joints often induced by some external violence. In treating of the diseases of synovial membranes, I have mentioned their liability to inflammatory action, as well as their tendency to the adhesive process; but the extent of the adhesive inflammation, is not so great as in the splanchnic serous membranes, disturbing at once, the identity between the two structures; this is wisely ordained by nature, as inflammation would almost invariably destroy the motions of a joint, had the synovial membranes an equal tendency to form such extensive adhesions. If the inflammation still continues in a joint, unsubdued by the treatment I have described, it leads to suppuration, and when this occurs it almost invariably happens that either the limb, or life must be sacrificed; sometimes, however, ulceration goes on, through the synovial membrane,—cartilages are absorbed, the bone granulates, and the disease terminates in anchylosis.

Abscesses sometimes form external to the synovial cavity, more particularly when the disease originates in the articular cartilages; means should then be employed to induce the rapid tendency of the matter towards the exterior, for fear of the synovial membrane becoming the subject of ulceration. Sometimes the antiphlogistic treatment will so check the acute symptoms of the disease, as to bring it to a stationary condition only; in this case it is usually to be feared that scrofula, or some other constitutional cause, has induced a specific action, and for which some specific remedies must be employed. When ulceration has taken place, and the articular cartilage is removed by the process of absorption, the bone of the joint becomes diseased, which advances more rapidly than the cartilage; but still from the comparative slowness in the vital action of all the parts entering into the composition of a joint, the process of restoration is so tardy, and the constitution is so affected, that irritative fever becomes usually an alarming symptom, hectic supervenes, the patient's life is endangered, and the only chance remaining is amputation of the limb.

To prove that the constitution is less affected by disease

of bone than of joints, it much more frequently happens that hectic results from diseases of joints while but little constitutional disturbance attends extensive disease of bones. After violent inflammation and long continued disease of joints it not frequently happens, that so soon as the articular cartilages have been removed by absorption, the extremities of the bones granulate, unite in the same manner as after fractures, and produce a true anchylosis. Immobility of the joint is, however, sometimes produced by an alteration in the softer structures of the articulation, which become the subjects of considerable stiffening and consolidation, and even sometimes conversion into bone; these changes may occur, either in part, or in all the structures of a joint. When this change of soft parts has not acquired a sufficient degree of firmness, so as entirely to destroy the mobility of the articulation, passive motion should be employed; by the judicious application of which, a useful power of flexion and extension may be acquired. During the process of anchylosis, it is the surgeon's duty to take care that the union takes place in such position of the limb as renders it best capable of performing its natural function; thus in the elbow-joint, the anchylosis should be produced at such an angle, as will enable the hand to be carried to the mouth by the motions of the shoulder-joint. The knee should be united with a very slight degree of flexion, so that it may not be so much shortened as to produce great lameness in walking, and yet sufficiently bent as to render the limb of the least inconvenience in the sitting posture. It sometimes happens that anchylosis is imperfect, and that a slight degree of motion remains, rendering the limb incapable of supporting the weight of the body: this is the most unfavourable state in which an anchylosed joint can be placed, for any attempt at progression inflames the articulation, and renders local, if not constitutional means necessary to subdue it. The recurrence of this inflammatory action is as frequent as the attempt to use the limb; the constitution becomes impaired by these repeated attacks of inflammation, and unless by any mechanical means you can produce perfect

consolidation, amputation at last becomes necessary. I have been obliged to amputate under these circumstances, and once for a gentleman, who with every means for keeping his limb in constant rest, still with every precaution, was so liable to inflammatory action in the joint, that he was anxious to have the limb removed.

I shall now detail some cases of diseases of joints illustrative of these morbid changes.

CASE.

George Scott, aged 17, indicating a very scrofulous diathesis, but still of an irritable temperament, was admitted into Guy's Hospital, January 31st, 1833, with a chronic affection of the left knee-joint. He states, about four years ago he fell down with his knee forcibly flexed, and as he termed it, bent under him, producing so violent a sprain as to render him unable to rise, or on being raised, to stand; he remained in the recumbent posture the remainder of the day, and in a few days was enabled to use the joint; by degrees it appeared to be quite restored to its natural state, as he suffered little or no inconvenience from the end of April until the Christmas following, when, without any apparent cause, it became painful and considerably swollen. He was now obliged to lay by and to consult a medical gentleman, who ordered leeches and poultices, which, in a great degree, relieved him, and enabled him, in about three weeks from the commencement of this attack, to walk a short distance, but upon the slightest jar or irregularity of step, he invariably suffered considerable increase of pain and inflammation, and was sometimes, from such slight causes, confined for several days to his bed; upon such an accession of symptoms, the pain increased to such a degree, and his constitution became so affected, that not finding the usual means relieve his symptoms, he applied at the Hospital for admission.

Upon examination at this time the joint was found much swollen and very painful. Upon either side of the patella there was a projection; not with the fluctuating feel of a distended synovial membrane, but rather that peculiar firmness, indicating the effusion of albumen and consequent thickening. He was himself incapable of moving the joint, but upon its being moved, there was a considerable degree of stiffness to overcome, and some slight feeling of roughness, though not amounting to crepitus, indicating partial absorption of the articular cartilage and great thickening of the synovial membrane from chronic inflammation. As there was considerable pain, heat, and redness about the joint, leeches, blister, and evaporating lotions were ordered, and tonics, with slight

alterative doses of mercury also administered. At first, he appeared to improve under these remedies, but so soon as the immediate effects of the local treatment had gone off, again he suffered from the recurrence of inflammation and pain in the joint. His health began now to be seriously affected, he had febrile action every evening, nightly perspirations, white tongue, quick pulse, and a hot skin, symptoms which did not yield to salines and anodynes. I therefore described to him the peculiar situation in which he was placed, and recommended him to sacrifice his limb for the preservation of his life. I expected some opposition to this proposal, from the peculiar irritable temperament of the boy; he, however, consented, and I amputated the thigh by a double flap operation on the 30th of March.

The boy bore the operation better than I expected; the hæmorrhage was easily stayed, the edges of the flaps readily approximated, and covered most completely the extremity of the bone, so as to produce a well formed stump. He seemed at once to have derived benefit from the removal of the cause of his constitutional irritation; his appetite improved, he slept better, the perspiration ceased, and three weeks after the operation the stump had nearly healed, when he caught a very severe cold, and the cough which was nearly incessant, produced some retraction of the stump, a portion of the cicatrix ulcerated, the extremity of the bone protruded, which soon, however, exfoliated, and the boy recovered.

On examination of the knee-joint, upon a vertical section being made through the patella, the extensor muscles above, and the ligamentum patellæ below, the following appearances presented themselves *(vide plate 3)*:—The synovial membrane, was found very much thickened, and vascular, particularly around the circumference of the condyles of the femur and the posterior part of the patella; it had also ulcerated upon the internal condyle, and the articular cartilage was softened, spongy, and partly absorbed. The synovial membrane, where it lined the internal lateral ligament of the knee-joint, between that and the patella, was much thickened from the quantity of albuminous matter which was thrown out, and that portion of the membrane passing from the head of the tibia to the condyles of the femur was also vascular and thickened. The ligaments were soft and altered in their structure, the semilunar cartilages themselves were healthy, but the synovial membrane covering them was much thickened. The bones were healthy. Notwithstanding the disease in the joint, suppuration had not taken place; indeed it is of much rarer occurrence than is usually believed, for there is almost always a mixture of the adhesive inflammation set up with it, which soon checks the suppurative and ulcerative processes.

From the history of this case, and from the appearances upon dissection, I am induced to believe, that had this boy applied for relief earlier, and been placed immediately under the best circumstances for his cure, his limb might have been preserved; but on the contrary, by motion, he was constantly keeping up an inflammatory action, the continuance of which, as I have before described, invariably produces such changes in the structures of a joint, as render it incapable of performing its natural function.

CASE.

Alex M'Alister, aged 40, a soldier, and a man of scrofulous diathesis, was admitted on the 24th of April, 1833, with abscess of the knee-joint. He states, that about four months since, he first experienced some slight pain in his knee, which was increased upon motion, and rendered him incapable of following his usual occupation. He now consulted a surgeon, who ordered him twelve leeches, which he applied, but without deriving any benefit; indeed there was rather an increase of pain and swelling after their application; he however applied more leeches, evaporating lotions, and the antiphlogistic regimen was strictly adhered to; even these means, did not however tend to diminish the inflammatory action in the joint, which went on to suppuration, and the abscess burst on the outer side of the thigh, just above the knee-joint, seven weeks ago, since which period there has been considerable discharge of pus, and his health has rapidly declined. Upon his admission into Guy's Hospital the joint had acquired a very considerable size, there was a copious discharge from the abscess of a thin watery fluid, and a sinus ran up the thigh to a great extent. A poultice was ordered to be applied to the knee, and a roller around the thigh; he has profuse perspiration of a night, with a cough indicating irritation, and he complains of excessive pain in the knee. He was ordered the sulphate of quinine with the infusion of roses, and an anodyne draught at bed-time.

30th.—On this day's visit, he complained of diarrhœa, his cough was much diminished, as also the perspirations, he is, still however, very weak, although he describes himself as feeling better.

On questioning him particuiarly as to the first deviation from the natural performance of the function of his limb, he mentions that twelve years since, he received a gun-shot wound, somewhere about the knee-joint, but his account was not sufficiently clear to enable us to form an opinion as to whether or not it had produced the exciting cause to this

disease. I now explained to him the nature of his complaint, the little hope there was of restoration of the joint to a useful purpose, and indeed the danger he incurred, from his constitution, of falling the victim to frequent attacks of inflammation; but as his health at that moment was hardly in a fit state to receive the shock of the operation, I attempted to improve it by the following medicines:

℞ Ammoniæ Carbonatis, gr. v.
Sodæ sub: carb: gr. xij.
Tinct: Cinch: ʒj.
Liq: Opii Sedat: gtt. vj.
Decoct: Cinchonæ ℥iss. M.
Ft. haust: bis in die sumend.

May 6th.—Cough much diminished both in frequency and urgency, purging entirely stopped, complains of nothing but want of rest at night, from the pain in the joint. Was ordered a grain and a half of calomel, and half a grain of opium at bed-time.

7th.—The amputation was performed by a circular incision above the knee, nor did any thing unusual occur during the operation, excepting that in the division of the deep layer of muscles, a sinus was opened, which upon examination was found large enough to admit the finger, and extending nearly up to the hip-joint. In sawing through the bone also, it was observed to be unusually compact, probably the result of the injury which he received from the gun-shot wound twelve years previously.

8th.—He reports that he feels quite an altered man, that he slept well after the operation, and in his own words "had neither ache or a pain to complain of."

11th.—Stump was dressed, the adhesive inflammation seems already to have nearly completed its union, it looks in every respect remarkably well, he sleeps better, and has little or no perspiration at night.

17th.—He is in every respect doing well, was ordered more generous diet, and a pint of porter daily. Thus he continued to improve until about the 10th of June, when without any apparent cause the stump became painful, the cicatrix inflamed, and considerable discharge took place from the old sinus, and his health again sympathized with his local affection. A white-wash poultice was ordered to be applied to the surface of the stump, the rest of the limb being bandaged. Tonic medicines, generous diet, and wine were ordered. Under this treatment, the discharge has gradually diminished, his health improved, and he may now be considered convalescent.

Upon the examination of the knee-joint, no traces could be found of the gun-shot wound which he had described.

The articular cartilages were in a state of ulceration, and the synovial membrane thickened and inflamed. Indeed all the structures were so disorganized, as to point out the propriety of the plan which had been adopted in the amputation of the limb.

CASE.

Thomas Horner, aged 18, a lad of peculiar weak and irritable constitution, who had never eaten animal food, was admitted April 3rd, 1833, with abscess in the thigh, and anchylosis of the knee-joint. He describes that he had not been able to use his knee-joint for six years in consequence of a fall upon his knee at that time, by which accident he displaced the patella; the abscess has been a subsequent disease, and attributable to no apparent cause; it does not, however, communicate in any way with the knee; he was admitted with a view rather to improve his general health by medicinal means, than with a hope of being of any benefit to him by surgical operation, but as his health improved under the generous diet of the Hospital, he began again to suffer from an inflammatory attack of the knee-joint, which was produced even by the slightest motion.

Upon examination of the knee, some slight degree of mobility was found to exist, although the anchylosis was quite established between the patella and femur; rest and local treatment soon allayed the inflammation of the joint, but immediately he began again to use it, so soon the inflammation recurred, and his health began to suffer from the frequent attacks of the disease. The boy was himself anxious to have his limb removed, and as he had now acquired sufficient strength to bear the operation, I performed it on the 21st of May.

The limb was removed by the double flap operation, in the performance of which nothing peculiar occurred, unless perhaps it may be said, that the vessels bled with more than usual freedom. In consequence of his great irritability, immediately after the operation, I ordered him twenty-five drops of laudanum, but which, instead of having the desired effect in allaying his irritation, produced nausea, and delirium, in a paroxysm of which, he attempted to strangle himself, and it was with difficulty that the neckcloth which he had tied round his neck could be removed in time to save his life.

22nd.—Complains of very great pain in the stump, accompanied with uneasiness in the abdomen; he has vomited some green fluid, his tongue white and coated. Pulse 120, small and hard; skin dry; has not passed any urine since the operation, but his bowels have been opened; his urine, was drawn off, which was dark coloured, but scanty; he was

ordered saline medicines, with calomel, true James's Powder, and opium; by this medicine his irritability was diminished, and he might be said in some measure to have overcome the shock of the operation, but his fretful irritability was still conspicuous; his diet was improved, sago and farinaceous food were ordered him, for he could not be tempted, even now, to partake of animal support. No change, however, occurred, and he might be said to be gradually improving until the 28th, on which day the stump was dressed, and notwithstanding the abundance of soft parts, which had been left at the operation, the stump had assumed a conical form from the protusion of bone, and only by the most careful dressing could the extremity of the bone be covered. Tongue white and coated, but moist; the skin rather above the natural temperature and dry; pulse still rapid and irritable; was ordered five drops of liquor opii sedat: to each dose of saline medicine; he was now persuaded to take some animal food.

June 3rd.—The stump was much improved in appearance, although it was still of a conical form, his general health was much improved, his pulse much less irritable, and he expressed a wish to have a mutton chop for dinner. He continued to improve in health, but the cicatrix ulcerated opposite to the projected bone, which protruded beyond the soft parts for an inch in length; with a view, therefore, of assisting nature's process in its removal, and consequently of this source of irritation, I sawed off the extremity of the bone. In doing this, however, I learnt a lesson, which will prevent my ever again interfering with the means which nature takes for throwing off an exposed portion of exfoliating bone. That the stump might be held perfectly steady during the operation, I requested an assistant firmly to fix the extremity of the bone with a pair of strong forceps, while I sawed through it above; immediately the concussion of the sawing was produced, the whole of the compact structure of the projecting portion of the bone came off in the forceps, leaving a soft, vascular, conical projection of the cancellated structure, granular, and beautifully demonstrating the process, by which the living separated the dead portions of bone, as well as the means by which the cancellated structure is capable of being blended in the reparation of soft parts.

Since this time his health and stump have both improved, and his irritability is daily diminishing; generous diet, and tonic with anodyne medicines, may now be said to have restored him to a convalescent state.

Upon examination of the knee-joint, it was found that the articular cartilages were thickened, softened, and presenting a pulpy mass, partly absorbed, so as to permit of ossific deposition; uniting the tibia, patella, and femur in some parts,

while the altered articular cartilages still separated them in others. All the structures of the joint, excepting bone, were also essentially altered in their texture.

It is also worthy of remark, that in these attenuated subjects, the muscles have always a greater tendency to retract, than in strong muscular people, and I believe I may say, that it has also been ascertained that they longer retain their vital principle, as indicated by their contraction, upon the application of a mechanical or chemical stimulus at a lengthened period after death.

It may appear strange that in the cases of amputation which I have described, the stumps have not united kindly, and that in two of them there was protrusion of the bone. I have, however, intentionally spoken of these cases, as illustrative of the tendency the muscles have to retract, when they have been long under the influence of the protracted disease of a joint, and this I am further induced to believe, as they are the only cases of retraction I can call to mind, or find reported in my case books.

For the following case, I am indebted to my friend and colleague Mr. Morgan.

CASE.

William Milne, a gardener, of regular habits, was admitted into Lazarus ward, October 31st, 1832, with violent inflammation of the right knee-joint, which had existed with varied degrees of intensity for eleven weeks. He attributes his complaint, to an exposure to wet and cold, and describes that when first attacked with pain and swelling, he consulted a medical man, who ordered him to apply leeches and blisters, which were repeatedly had recourse to, without any sensible benefit; but after his admission into Guy's Hospital, the inflammatory action was gradually diminished by repeating the leeches, and at the same time giving the sulphate of magnesia mixture, with colchicum; but although his pain was thus diminished, while in a state of rest, he was yet incapable of moving the joint without the most excruciating suffering.

November 12th.—His constitution begins to be affected; he has cough, nocturnal exacerbations of fever, with a quick and irritable pulse

a hot skin, and now, not only suffers from the slightest motion, but experiences a constant gnawing pain in the joint. Mr. Morgan therefore ordered him calomel and opium at bed-time, and saline medicines, with colchicum and conium; the latter was added in consequence of his being occasionally troubled with a cough: as his pulse remained very quick and irritable, he was ordered the following mixture:

℞ Tinct: digital: gtt. viij.
Liquoris opii sed: gtt. xx.
Julep: ammoniæ ℥iss. M.
Ft. haust: bis in die sumend.

Under the influence of this medicine he immediately began to improve; he slept well, and the joint became less painful; although he was still quite unable to move it, the attempt at which produced a degree of inflammation that rendered leeches necessary: his appetite was good. He went on thus gradually improving until the 18th of January, when it was found that his knee had perfectly anchylosed, and that there was now little or no pain. He was ordered the emplast: hydrarg: c: sapon: and to sit up every day.

February 4th.—Is now able to bear weight upon the limb; the joint remains perfectly immoveable; but in the course of a fortnight he was enabled to walk tolerably well with a stiff knee, and left the Hospital on the 20th quite well.

The peculiarity of this case, is the rapidity with which inflammation of the synovial membrane, from a common cause, terminated in perfect anchylosis, leading, in my opinion to the belief, that there must have been some specific constitutional derangement. When anchylosis is produced merely from inflammation of the synovial membrane, it takes place slowly, and seems rather to be induced from the perfect inaction of all the structures of the joint, than by the primary disease extending to them. For instance, the secretion of the synovia is entirely checked, and an adhesive inflammation immediately follows, producing much the same effect as the adhesions of the pleura and peritoneum, and thus motion is rendered difficult and painful, so that the joint becomes more permanently fixed than before; no weight can now be borne upon the limb, and the other structures begin to set up a diseased action, from the entire cessation of the performance of their natural

functions. Articular cartilage, ligaments, and even the tendons of muscles, have their physical properties altered, and become rigid, and the motion of the joint is in this way still further diminished; here, sometimes, the anchylosis terminates, and a general rigidity of the joint is produced, without, however, perfect bony union; while, at other times, the articular cartilages become absorbed, the extremities of the bone inflamed, and permanently united. This seems to have been the mode, by which the consolidation of the knee-joint occurred in the above history, but the rapidity of its completion forms the peculiarity of the case.

The knee-joint, in Horner's case, offers the peculiarity of anchylosis, partly by bony union, and partly by the altered texture of the other structures of the joint; for, on making a section into it, spiculæ of bone were seen shooting out between the remaining portions of articular cartilage.

I consider the following case worthy of relation, because the attack was so similar to the last described, and under the same treatment was readily cured, proving how much local affections are under the influence of constitutional remedies.

CASE.

George Ledger, aged 24, was admitted, on January 4th, into Guy's Hospital under the following circumstances. He states, that six weeks ago he was exposed to cold and wet for several hours, and soon afterwards was attacked with pain and swelling of the left knee, which became so urgent as to lead him immediately to apply for medical assistance. Twenty leeches were ordered, and a blister applied; he had subsequently rigors at irregular intervals, rendering the repetition of the leeches and blistering necessary. At present, there is considerable swelling of the joint, great tenderness on either side of the patella, and a heavy deep-seated pain within the knee, much increased by any vertical pressure, so as to force the articular cartilages against each other. His pulse was 100, sharp, and jerking; he was ordered to apply six leeches, every other night, to the knee, to take fifteen grains of rhubarb and four of colomel twice a week at bed-time, and the following draught twice a day.

℞ Spirit æther nitr: ʒj.
Tinct: hyosyami m. xxv.
Liq: ammoniæ acet: ℥ss.
Aquæ puræ ℥j. M.

He continued this treatment gradually improving under its influence, until the 24th, twenty days after, when the swelling of the joint was much diminished; there was no pain, or even tenderness upon pressure, but still he could not bear the joint to be moved. Another blister was therefore ordered to be applied to the knee: this to be kept open, with the savine ointment, and to continue his medicines.

February 22nd.—He can now bear slight motion of the joint without pain, but the attempt at flexion, beyond a certain point, still produces considerable uneasiness over the patella; the constitutional disturbance is greatly diminished. Counter irritation was ordered to be continued, and tonic medicine administered.

March 8th.—The joint can now be flexed without giving pain, and passive motion is regularly employed; he gained strength daily, and in a few weeks after was discharged perfectly restored to health.

Such cases as the last are constantly applying for relief; sometimes induced by mere local causes, and sometimes the results of specific constitutional affections. When from external injury, the application of leeches, fomentations, and perfect rest, usually check the progress of inflammation, and adhering for a short time to the antiphlogistic discipline will commonly prevent the recurrence of an attack; but, if there be any specific action, such as rheumatism, then the repetition of bleeding by a few leeches, and administering, at the same time, colchicum internally, seem to be the proper treatment. I am doubtful, if in these cases, blisters are of much service. When in a scrofulous diathesis, joints are attacked by inflammation, whether of a common or specific kind, the want of power in these constitutions renders the necessity of great precaution in depletion; and, although it may be sometimes necessary to use topical bleeding, still, in such cases, generous diet, and tonic, with alterative medicines, are the means to be employed.

When a joint is inflamed and rest is enjoined, it does not merely mean, that the patient is not to move about, but a

splint should be applied, so as completely to fix the joint, until the inflammation is entirely subdued. When passive motion is required, care must be taken that it does not induce the recurrence of inflammation. Exposing the diseased limb to the effects of vapour, will frequently facilitate the mobility of the joint and permit of passive motion being employed, when, without such an auxilliary, it might not be borne.

Diseases of the Hip Joint.

The peculiarity of this disease is the insidious manner in which the patient is attacked; and almost one of the first symptoms which attracts the attention of the patient, is a pain on the inner side of the knee, leading the cursory observer, not unfrequently to apply remedies to this part, which suffers only sympathetically from a distant disease When children are attacked with this complaint, the parents first discover either that the child limps in its walk, without having previously complained of any pain; or, perhaps, in undressing the child, they may have noticed that the lateral gluteal regions are not symmetrical. Upon questioning the child, it now, for the first time, complains of a pain upon the inner side of the knee; the distressed parents immediately attribute these circumstances to some local cause, and the nursery-maid is almost invariably condemned for having concealed some accident, which they feel convinced must have induced the supposed local injury. But directly the child walks into the room, or, perhaps, when put down from the arms, a surgeon of any experience, at once understands the nature of the disease; the affected limb is thrown forwards, the pelvis upon the same side is depressed, so as to give the appearance of a lengthening of the limb; and upon closer examination, the affected limb will be found much diminished in size. The patient is unable to bear any weight, excepting on the sound leg, and, consequently, cannot stand perfectly erect; pain is experienced on striking the trochanter major, in such a direction as tends to force the head of the bone

into the acetabulum, and also from pressure in the inguinal region immediately to the outer side of the femoral artery, as it passes under Poupart's ligament. The buttock, on the side of the diseased hip, is, in the early stages, much more prominent than natural, but ultimately becomes diminished and flattened, so that flattening, at this period, forms one of the diagnostic marks of the disease. The sympathetic pain is not invariably experienced in the knee-joint, as it is frequently referred to the inner side of the thigh, sometimes producing involuntary twitchings of the muscles.

Although I have described this disease as usually occurring to young people, there is scarcely any period of life, until old age, that it does not occur, although certainly, more frequently before the age of fourteen.

The first object of the surgeon, when called to such cases, should be to discover the exciting cause of the complaint, whether it be local, constitutional, or of a specific action. If from external injury the inflammation has been induced, as does not unfrequently occur in the exercise of fencing; cupping or leeches, with blisters, and rest for some short time, will usually subdue the inflammation of the synovial membrane. It may, however, under these circumstances be a more severe injury, as the ligamentum teres may have been injured, an accident which can hardly occur but in that particular position of longeing. Should such have been the result of this exertion, a greater length of time, and more active depleting means, would be required to subdue this greater source of injury. When the disease is idiopathic, it becomes much more difficult to treat, and the prognosis will be less favourable; the constitution becomes early affected, a swelling in the neighbourhood of the joint occurs, and twichings of the limb, particularly during sleep, disturb the rest of the patient, who is now totally incapable of bearing the slightest weight upon the extremity. If the swelling increases, and the pain becomes aggravated, more especially during night, attended with rigors, nightly exacer-

bations of fever, rapid pulse, hot skin, and a furred tongue; the surgeon is led to the conviction of matter having formed, and an opening should be made as soon as fluctuation denotes its precise situation. From the slowness of the progress, from the degree of constitutional irritation, from the length of time matter continues to flow after the abscess has been opened, and from the unhealthy kind of pus which is secreted, frequently offensive and discoloured, I am induced to believe, that the disease of the hip, which terminates in abscess, most frequently begins in the bones of this articulation, and that the cartilages are not primarily affected, as has been stated by some writers. In young people, the disease most frequently first affects the bones of the pelvis, the acetabulum becoming diseased before the femur; indeed, it not very unfrequently happens, that the abscess bursts into the cavity of the pelvis; and in the Museum of St. Thomas's Hospital, there are one or two preparations in which the abscess had burst into the rectum. When the cartilage is primarily affected, which I believe to be but of rare occurrence, the symptoms are less urgent, and the patient is capable of performing the common avocations of life, during the progress of its removal by absorption. This fact is exemplified by No. 1315 preparation, in the Museum of Guy's Hospital, in which a considerable portion of the articular cartilage had been absorded, although no disease of the hip-joint had been suspected during the life of the individual. Under such a disease, although articular cartilage is never reproduced, a peculiar deposition, somewhat resembling the enamel of the teeth or porcelain, is secreted, which will enable the joint to perform a considerable degree of motion without consequent inflammation. Inflammation of the synovial membrane is very frequently of a specific character, either from rheumatism or gout; leeches, fomentations, and blistering, are the local means to be employed, while colchicum, with neutral salts, and hyoscyamus, are the constitutional remedies, to which these diseases will generally yield. It is, however, of rare occur-

rence, that the hip-joint is the subject of disease from external injury, but much more frequently from scrofulous affections, generally terminating, either in permanent lameness from anchylosis, or death from the debilitating effects of extensive abscess.

Our mode of treating the numerous children who apply to us for relief at Guy's Hospital, is first, by local bleeding to subdue inflammation, by continued counter irritation, to divert the inflammatory action, and then attempt to improve the constitution by alterative and tonic medicines; thus, I generally order two grains of hydrarg: c. cret:, two of rhubarb, and five of carbonate of soda every night, and the following drops twice a day:

℞ Tinct: Cinchonæ ℥j.
Tinct: Rhei: ℥ss.
Hydrarg: Oxym: gr. j. M.
Capt. gtts. xxv. bis in die, ex cyatho Infus: Anthem.

Such patients as are brought into public hospitals, will almost invariably derive great benefit from this treatment, and from the generous diet with which they are provided; but if the children of the affluent be affected with this disease, being already accustomed to the continued influence of nutritious diet, that great source of restoration is lost to them, and the prognosis, under these circumstances therefore, is much less favourable in private, than in public practice. The sequel of a continued diseased of the hip-joint is not unfrequently a spontaneous dislocation, and when this displacement occurs, the head of the femur is invariably drawn upwards by the action of muscles. Under these circumstances, all the structures entering into the composition of the joint are altered, if not destroyed by the disease; the bone of the acetabulum first becomes affected, the cartilage is loosened from the cotyloid cavity, and ultimately ulcerates; the fibro-cartilage next becomes implicated in the disease, the ligamentum teres ulcerates, the head of the femur undergoes similar changes, and the glutei muscles draw it upwards upon the dorsum of the ilium; all these morbid changes

frequently go on, without the patient experiencing any great pain while in a state of rest, until abscesses form, when pain, constitutional irritation, and hectic fever, indicate suppuration having commenced.

I have a gentleman under my care, the subject of diseased hip; some circumstances of whose case I shall relate, as the suddenness of his attack, the severity of his symptoms, and the comparatively slight degree of injury his constitution and the joint seemed ultimately to sustain, are points worthy of peculiar notice.

CASE.

Mr. C. aged 28, consulted me in consequence of having observed for a fortnight previous, that in walking he experienced a difficulty in raising the left foot clearly from the ground, and that he had an involuntary tendency to bend his body forwards during progression; these symptoms were unattended by pain, although he sometimes felt slight uneasiness on the inner side of the knee-joint, and a sense of weariness of the whole limb. On my asking him if there was any local cause to which he could attribute these symptoms, he mentioned, that seven weeks before, while in the performance of some athletic exercise, he felt a sudden darting pain, attended with a sensation of snapping just below Pouparts ligament, in the centre of the inguinal region, and since that time, he thinks he has constantly thrown more weight upon the other limb. On asking him to walk across my room, I observed that the diseased leg was in advance of the other, that his body was bent forwards to that side, and that in progression he used a stick, which he constantly employed in receiving the weight of his body, when the diseased limb should in its turn have borne it. On examining the pelvis, both in the anterior and posterior view, there was evident deformity; in front, the anterior and superior spinous process of the diseased side, was seen depressed below that of the opposite; laterally, the trochanter major formed an obvious unnatural protuberance; and behind, the gluteal region, from its projection, formed another diagnostic mark of the disease; the muscles of the thigh also, were considerably wasted.

Notwithstanding all these decided external signs of hip disease, still this gentleman was capable of following his usual avocations, although they called for the necessity of walking some distance daily. I explained to him the nature of his complaint, and with difficulty impressed upon his mind the necessity of his remaining for a length of time in a

perfect state of rest; for I ascertained by moving the joint, and striking the trochanter major, so as to produce concussion of the head of the bone against the acetabulum, that there was not only inflammation of the synovial membrane, but that disease had commenced in the articular cartilage; his bowels were regular; pulse 100, and rather sharp; tongue white, and like the pulse indicating irritation. I requested him immediately he got home to be cupped to sixteen ounces on the hip, and afterwards to apply a full-sized blister over the joint, and to take the following medicines:

℞ Hydrarg: submur: gr. iss.
Pulveris Opii gr. ss.
M. ft. pulv: omni nocte sumend.

℞ Iodinæ gr. ss.
Potassæ Hydriod: ʒss.
Syr: Papav: ℥ss.
Inf: Gent: Comp: ℥viij.
M. Capt. Cochl: larg: ij. bis in die.

The next day I found him in every respect worse, he complained of considerable pain in the hip-joint, extending down the inner side of the thigh to the knee, with inability to obtain ease from any position in which he could lie; I therefore increased his quantity of opium, ordered the blister to be kept open, and desired him to continue his mixture. In this state the patient remained without any improvement for nearly a month, during which period, I affected his constitution by mercury, indicated by ptyalism, and gave him sarsaparilla, bark, and other tonic medicines, without, however, producing any beneficial effect; his pain was incessant, his constitution suffered materially, having some degree of hectic fever; and as soon as he fell asleep, he experienced those sudden twitches of the muscles at the upper and inner part of the thigh, —the symptom of all others most indicative of the formation of matter; this result was further threatened by a tumour, which was now evident in the inguinal region; these symptoms were, however, unattended by any distinct rigors. I ordered leeches to be applied to the tumour, and afterwards a belladonna plaster; and as the bowels were at this period rather confined, attended with some disposition to nightly perspirations, prescribed the following medicine:

℞ Sulphatis Quininæ gr. ij.
Magnes: Sulphat: ʒj.
Syrup Aurantii ʒj.
Liquoris Opii sed: gtt. iv.
Infusi: Rosæ Comp: ʒx.
M. ft. haust; bis in die sumend.

I also passed a seton just below the trochanter major, including two inches of integument.

From this period, his symptoms were in some measure mitigated, his pain became less, his appetite improved, his nightly twitches diminished, and he was enabled to change the position of his limb, with comparative ease to himself. From his mitigation of suffering, he continued to improve in general health; he was able to sit upon the sofa, and with crutches even to walk about his room, so as to bear some slight weight upon the diseased limb, which gradually lost its apparent morbid length; the prominence of the gluteal region diminished, the muscles of the thigh regained their tone, and the patient may now be considered convalescent, after three months illness.

This case affords the interesting fact, either, of all the symptoms of the formation of matter without the reality, or of the power of the restoration of the joint, even after matter has formed. The impression on my mind during the progress of the disease certainly was, that matter had formed; the circumscribed swelling, the nightly twitchings, the tendency to hectic fever, the intolerance of motion, and the general effect produced upon the constitution, when summed up, led to a most unfavourable prognosis; but continued rest, tonics, and generous diet restored his constitution, which in itself was sufficiently strong to undergo this severe ordeal. One peculiar symptom occurred in this case, that when the patient first placed himself in the erect posture, he described a sensation in the hip-joint, as if his capsular ligament was so filled with air as to prevent the head of the femur coming in contact with the acetabulum, communicating to him the sensation of the elasticity of an air bag; nor did this morbid sensation cease for several weeks. This sensation must have occurred from some effusion, and as I cannot believe it could be pus, from the sequel of the case, it may probably have been the effusion of synovia only which had produced it.

ON DISLOCATIONS.

Having taken into consideration the diseases and accidents to which the bones and joints are liable, I cannot well omit to describe the dislocations which have fallen under my observation, during my practice at Guy's Hospital; nor should I feel it necessary to make any prefatory remarks, but that Sir Astley Cooper has written a book expressly upon this subject, and I feel that I can do little else in attempting to lay down principles for the remedy of such accidents, than quote him. His book has already passed through so lengthened an ordeal, and gained so completely the approbation of the professional public, that Sir Astley Cooper needs no fresh eulogy from me; nor do I fear the charge of flattery in attempting to express my conviction of the practical utility of his work, after the various, yet concurrent testimonies which have been publicly acknowledged.

By a dislocation is meant, the displacement of two or more articulatory surfaces, which were naturally contiguous in the formation of a joint. Speaking generally of the diagnostic marks which lead the surgeon to a knowledge of the accident, it must appear at once obvious, that the normal state of the affected articulation should be thoroughly understood; not merely the precise form of each articulatory surface separately, but their relative situations with respect to each other, considered collectively: and this investigation should be studied, equally in a state of rest, and in motion; examining at the same time, the changes to which the tendons and muscles are subjected under every variety of action; for thus, and thus only, can the deformity produced by dislocation be distinguished from the concomitant swelling of contusion to soft parts.

A joint is liable to luxation, in exact proportion to its degree of mobility; thus the diarthrodial articulations are most frequently the subject of this accident. It is the diarthrodial articulations also, which are under the influence of the greatest number of muscles, the force against which you have to contend; hence, therefore, the necessity of a well adjusted mechanical apparatus to produce reduction. I have mentioned these facts, to prove the necessity of certain principles which should regulate a surgeon's mind, as he examines a dislocated joint, and directs the means that are to be employed for its restoration. The kind of joint dislocated is as essentially a matter for consideration, as in fracture it is right to consider the class of bone which is broken; thus in synarthrosis, the displacement of the articulatory surfaces of the joint, leads frequently to the injury of some important organ, and the probable suspension of some vital function. In a similar accident to a diarthrodial articulation, it is the fixed position, and loss of voluntary motion of the injured part, which form the principal diagnostic marks; whereas in the amphiarthrodial joint, both important function and voluntary motion, are liable to be impaired. It is, however, dislocation of the diarthrodial articulation, which most frequently comes under the consideration of the surgeon, and which requires the application of mechanical means for reduction. The direction of the dislocated bone is also a matter of the greatest importance, as it not only forms a prominent diagnostic mark of the nature of the accident, but directs the surgeon to the proper application of the extending force, by means of which he is to restore the bone to its natural position. The length of time since the occurrence of the accident should also be duly considered, as the surgeon who uses violent means for the reduction of a dislocation, which occurred a considerable time before, would have as much reason for regret, as one, who from ignorance of the nature of the accident, had not attempted it in the first instance, but left it an unreduced dislocation.

There may be other circumstances concomitant with dislocation, which render the accident very complicated, and requiring, therefore, the mature consideration of the surgeon. The immediate effects of a dislocation, are not only to change the form of the affected joint, and alter the general contour of the whole limb, but at once to impede its natural motions; and not only as far as refers to the power of the patient himself, but even the attempts of the surgeon to produce them. Hence it may be considered, that immobility forms one of the strongest diagnostic marks of dislocation. The degree of immobility differs, however, with respect to the time since the occurrence of the accident; at first, a considerable degree of motion may remain, when in a few hours the limb may become firmly fixed in its new situation by the permanent contraction of the muscles. The length of the affected limb, as well as its position, also form diagnostic marks of this accident; but almost each articulation, in these points, presents something peculiar, so that there is no general deformity to be described; unless indeed it may be said, that inordinate length must indicate the existence of luxation. The enarthrodial articulations are liable to luxation in every direction, from the centre of the circle which is formed by the articular cavity; although we shall find it necessary, when speaking particularly of the dislocation of each joint, to describe that the displacement takes place more readily in some directions than in others; relating to some peculiarity in the construction of each joint.

With respect to the ginglymoid articulations, the bones which enter into their composition when dislocated, are displaced by being thrown either from side to side, or from behind to before; a knowledge of which leads readily to the diagnosis, whatever may be the deformity of the limb produced by the tumefaction of the soft parts. It is from the direction of the bones, that luxations are frequently named; hence the terms dislocation upwards, downwards, forwards, and backwards.

Dislocations are not always complete, so that the articula-

tory surfaces do not entirely abandon each other, although they no longer exactly correspond. It is the ginglymoid joints which are more frequently the subject of partial dislocations, as would be supposed, when we consider the large articular surface which each bone presents, that enters into their composition: if one of these joints become the subject of a complete dislocation, it is an accident of considerable danger, from the great force necessary to effect it. Some of the enarthrodial joints admit of a partial dislocation, as we see in the displacement of the head of the humerus, upon the inner edge of the glenoid cavity of the scapula; but in such joints, the displacement is usually complete. The time which has elapsed since the occurrence of a dislocation constitutes a point of considerable importance. Reduction should be attempted as soon as possible after the displacement, but the precise period, at which it would be wrong to make an attempt to reduce a dislocated bone, is a point which has not, and perhaps cannot, be decided. If a bone be dislocated, and be allowed to remain unreduced, we find that nature sets up a process for the purpose of forming a supplementary joint; at the same time, the original articular cavity and head of the bone undergo such changes as render them unfitted, even if their coaptation could be perfected, again to perform their natural function; and indeed, the new articulation will be found by far the more useful joint of the two. The exact period, however, at which the changes occur, must differ in different individuals, depending upon the constitution of the person, and in some measure, perhaps, upon the local circumstances connected with the accident, as well upon the joint affected. I have reduced a dislocation of the humerus three months after the infliction of the injury, and the patient had perfect motion of the limb restored to him. Several instances, however, are on record, in which, from the violence used to reduce a bone which had been for a length of time dislocated, such severe injury had been sustained, as to place the patient under much worse circumstances than if the accident had been allowed to remain unreduced.

The extent of constitutional irritation, which follows a dislocation, depends, in a great measure, upon the degree of force which produced the injury, and the consequent laceration of the soft parts of the joint. The peculiarity attending the subsequent inflammation of joints, is, that in consequence of the comparative little vitality of all the parts entering into their composition, they are, upon the application of an injury, slow to suffer from the effects, or to communicate to the system generally, any constitutional symptom; although producing thus insidiously, yet it almost invariably happens, that when the diseased action is set up, symptoms of the most alarming kind follow; it being a general law of nature, that constitutional sympathy or irritation, is always great in proportion as the part affected has but little power of self-reparation. Great attention should therefore be paid to all the circumstances concomitant with dislocation, and every means employed to prevent the immediate effects, and continued for some time after, as symptoms may supervene at some distant period. In compound dislocations, when the articular surfaces of the bones are exposed, complicated with great laceration of soft parts, and rupture of blood-vessels, amputation must almost necessarily be required, and especially in the ginglymoid-joints, as the injury must have been excessive to have produced displacement to so great an extent.

The causes of dislocation have been divided into constitutional and local, or internal and external. The constitutional and internal causes, may depend upon a general degree of laxity of the fibrous tissue, producing a great disposition to luxation, or from the sudden absorption of the synovia after hydrops articuli; the peculiar form of a joint also induces a tendency to the displacement of its articular surfaces; hence we find the shoulder much more the subject of luxation, than the hip. A diseased state of the structures entering into the composition of a joint, not unfrequently leads to a spontaneous displacement, the hip-joint is frequently thus affected.

It is, however, the local or external causes, which most frequently produce dislocation, and the application of the

force necessary to displace the surfaces of the bones forming an articulation, differs in almost every joint. This is a matter of considerable importance to the surgeon, in learning the history of the accident, that he may understand the concomitant circumstances, such as the liability of other parts to injury, from the direction of the force of the exciting cause; thus, for instance, in the enarthrodial articulations, before any force can produce luxation, the axis of the bone must be oblique, with respect to the articular surface with which it is connected; and further, that however oblique it may be, there are still some directions in which each joint is more liable to luxation than others, depending either upon the form of the articular surface, the strength of the ligaments, or the power of the muscles preponderating in some one direction. These are points essentially to be considered in studying the cause of a dislocation, as they lead to a just diagnostic, and a safe prognostic judgment. In proof of what has been said, in reference to the necessity of an angle being formed by the bones of an enarthrodial joint, before they can be dislocated, who ever heard of the shoulder-joint being the subject of this accident, while the arm was placed by the side and perpendicular to the glenoid cavity; or of the hip, unless the body was bent over the thighs, or the inferior extremities widely separated? The position of the body, at the time of the application of the force producing the injury, is the best guide to the direction of the dislocated bone. Thus the history of the cause may lead to the diagnosis in dislocation of every joint; though, in each, there may occur some variety, still, a perfect knowlege of the healthy motion of the injured articulation, as well as of the direction of the inflicted blow, will tend considerably towards the diagnosis, whatever may be the deformity produced by the swelling of the soft parts. There are, however, several symptoms of dislocations which mark the nature of the injury, even although no history can be gained of the cause of the accident; these signs are purely demonstrable, and best appreciated by those surgeons who have the most correct knowledge of the natural contour of

the injured joint. No dislocation can occur, without the limb being either shortened or lengthened, or without considerable alteration in its general form, natural direction, and loss of motion; all which circumstances form diagnostic marks of dislocation. The loss of motion is not merely meant to imply the want of power of the patient to perform this function, but the immobility of the joint affected,—preventing the surgeon even producing the natural motion of the joint, unless by employment of a force sufficient to restore the displaced bones to their natural position. These external signs are not equally obvious in all articulations; for instance, the shortening of the limb is not so perceptible in dislocation of the hinge-joints, as in the enarthrodial; the angular deformity in the former dislocation, being by far more obvious. In dislocation, the shortening, and the direction of the bones, may not always be very perceptible, in consequence of tumefaction, still the immobility of the joint affected, must form a leading symptom to the nature of the accident. It generally occurs, that the articulatory surface of the dislocated bone may be felt in its new position; but, even should that not be the case, the relative situation of the natural eminences and depressions of the joint must be changed, and to the anatomist lead to a just diagnosis. There may be, and indeed frequently are, many symptoms similar to fracture; but the immoveable state of the limb in dislocation, and the unnatural mobility of the fractured bone, will always form a sufficient distinction, so as to leave no excuse for mistake. In those dislocations, which occur from constitutional causes, such as from relaxation of ligaments, or paralysis of muscles, as there is no attendant inflammation, the diagnosis is generally more easy, and the dislocated bone can, as it were, be seen in its new position. I have known two or three persons, who, from very slight causes, were frequently dislocating, in one case, the patella, and in another, the shoulder-joint, which accidents being unattended with any inflammation, were always immediately perceptible and very readily reduced.

The prognosis of dislocation, is formed from the consideration of the class of joint to which the accident has occurred; from the extent of displacement of the dislocated bone; from the new position in which it is thrown; from the length of time since the accident has occurred; and from the injury to the neighbouring soft parts. The luxation of an enarthrodial articulation leads to a more favourable prognosis, than in a ginglymoid joint, in consequence of there generally being much less injury to the soft parts, as a less degree of external force displaces their articulatory surfaces. In the luxation of some joints, and particularly in the shoulder and hip, the head of the bone is so widely separated from its articular cavity, as to indicate, not only the laceration of the capsular ligament and synovial membrane, but frequently also the rupture of tendinous and muscular fibre; leading, therefore, to a more unfavourable prognosis than when the displacement is less, as the laceration of a nerve, in such cases, may lead to the permanent paralysis of a muscle. The prognosis is also very likely to be affected by the consideration of the direction of the head of the luxated bone; by the observance of which, the surgeon is enabled to judge of the probable injury done to the neighbouring parts, as leading to paralysis by pressure on the nerves. In dislocations of the hip, the anterior crural and sciatic nerves are endangered from certain positions of the bone; and even blood-vessels may suffer, although they are more liable to injury from the extent of displacement, than the direction of the dislocated bone. There is no point more essential to be considered in forming the prognosis of these accidents, than the length of time which the dislocation has been allowed to remain unreduced; for not only is the bone more firmly fixed in its new position, by the acquired rigidity of the muscles, and the altered structure of the injured ligaments, but also in proportion to the time such changes occur, so as to render reduction difficult, and often highly improper; thus, after a certain period, nature sets up an action for the formation of a new joint, when it is often better to leave the limb in its new position,

than to make any attempt to return it, as the changes now produced in the articulatory surfaces render them but ill-adapted for the restoration of their former function. Therefore, let it be an established law in the minds of all surgeons, to reduce a dislocation as early as possible after the occurrence of the accident. If, in the decision of the prognosis an unfavourable opinion be formed, it may be either the loss of the joint, or the danger of life, which may become the important consideration. The circumstances, which endanger the permanent loss of the articulation, may be, either from the length of time which the dislocation has occurred, or the change of structure which followed the violence employed for the reduction; in the former of these cases, it would be the surgeon's duty, by every means in his power, to assist nature in the formation of a supplementary joint, by gentle motion of the head of the bone in its new situation; while in the latter case, surgical, as well as mechanical means will be required to subdue the inflammation, and to prevent anchylosis. When life is endangered from the effects of a dislocation, it must occur from concomitant circumstances, such as great laceration of soft parts, rupture of blood-vessels, and injury to the nerves; such a complicated accident generally renders amputation necessary, although the surgeon, before he condemns the limb, should dwell upon the natural powers of his patient, and proportionate probability of reparation.

The object in the treatment of dislocation is very similar to that of fracture, namely, the employment of means to place the bones in coaptation, and the application of an apparatus to retain them. Extension and counter-extension are necessary for the first object, while bandages alone are usually sufficient to preserve them in their natural position, after they have been reduced. It may be said, therefore, that the great distinction, in the treatment of dislocation and fracture, depends upon the facility, with which coaptation is produced in fracture, and the difficulty with which that coaptation is retained; while on the contrary, in dislocation,

it is the coaptation which is so difficult, but when once produced, is easily secured.

In the application of the means to be employed for the reduction of a dislocated bone, an extending and counter-extending force are quite essential; and it is indeed, upon the judicious application of the mechanical apparatus, through which the power is to be applied, that the whole art of overcoming the muscles of the injured joint depends, for these only form the vital power of resistance to reduction. In dislocations of the enarthrodial articulations, the counter-extending force is that employed for fixing the bone which presents the articular cavity, and from which the dislocated bone is removed. By the judicious application of this force, the whole of the extending power is made to act upon the displaced bone.

When luxation takes place in a ginglymoid articulation, the counter-extension is then rendered as active in producing reduction, as the extension; as it is necessary that an opposite motion should be produced to restorethe bones to their natural situation. The direction of the extending and counter-extending force, differs in the displacement of the bones of almost every joint, and even in the different dislocations of the same joints; but yet a general plan may be adopted, as the force in all is to be applied in a line continuous with the dislocated bone. The degree of force which may be necessary to produce the desired effect, depends upon various circumstances, but principally upon the resistance which the muscles present; upon the kind of joint luxated, upon the length of time which it has remained displaced, and upon the degree of laceration of the ligaments and tendons which strengthen the affected articulation. Upon these considerations, therefore, the surgeon attempts to reduce a dislocation, either by his own muscular power, or by the use of pulleys. In my opinion, it is always better to employ the pulleys, whenever the surgeon believes that by himself he would not be able to overcome the muscular force of his patient; as it is impossible to derive the same

effect by the assistance of two or more persons, as from the force of these mechanical means, in consequence of the difficulty of men producing a simultaneous effort; nor are they able to maintain in the same manner the continued equable tension on the muscles, so essential to overcome their tonic power of contraction; therefore, in a strong muscular man, it is always better to have recourse to mechanical agents, assisted by constitutional means, for the reduction of a dislocation. This object is gained by such remedies, as diminish the vital action of the muscular system; hence bleeding, hot bath, and tartar emetic are to be employed, whenever the surgeon considers that without these auxiliaries, a degree of force would be necessary that might endanger lesion of the parts, or disorganization of the limb affected. When bleeding is employed for this purpose, the blood should be drawn from a large opening, and while the patient is within the bath, or at any rate in an erect position, so as to produce, at the least expense to the constitution, a state of approaching syncope, and which state may be maintained by frequent small doses of tartarized antimony in solution. When the patient is brought to that condition which the surgeon considers most favourable for the employment of the means of reduction, he should be placed in the recumbent posture, either upon a large table, or the floor, whichever may be most convenient; this, I hold to be essential, as in that position you deprive the patient of forming any fixed point for his remaining muscular action. As I have before said, no other general rule can be laid down for the direction of the extending, and counter-extending force, than in the long axis of the displaced bone; which force is to be applied slowly, with the view, rather to tire the muscles by continuance of extension, than to overcome them by force. It may be right, however, sometimes to deviate from the axis of the bone, if by so doing you are enabled to relax some very powerful muscles, by effecting which, you derive an advantage more than compensating for the deviation from the general rule.

Sometimes the object of overcoming the muscles is facilitated by speaking to the patient during the efforts at reduction, when immediately upon the mind being drawn from its object, muscles being no longer under its controul, yield to extension, and the bone suddenly slips into its place. In illustration of this fact, Sir Astley Cooper mentions a case, when after several efforts which the dislocated arm had resisted, he said to his patient "Rise, Sir, from your bed;" this he made an effort to do, and the extension being continued during this attempt, the bone snapped into its socket. After the force has been applied for some little time, it may be noticed that the muscles yield, and the deformity of the affected joint becomes altered; this point should be well observed, as it enables the surgeon to alter the direction of the force, so as to facilitate the return of the head of the bone into its articular cavity; because in the slightest alteration in the position of the dislocated bone, there ought to be a similar, and if possible, a simultaneous change in the direction of the extending force. The efficacy of the employment of this rule is well exemplified by the facility with which dislocations of the humerus into the axilla are reduced, where the surgeon is himself capable of applying sufficient force by placing his heel in the axilla, and making extension from the wrist; this facility I attribute to the immediate consciousness, communicated to the surgeon by his heel, of the slightest motion of the bone, and the aptness with which he is enabled simultaneously to alter the direction of his extension, as indicated by the change of position of the head of the bone. Thus I have frequently seen a dislocated humerus reduced by this well adjusted force, after much more powerful means had failed to produce the desired object.

Some surgeons have recommended, that when the muscles have been kept for a length of time in the necessary state of tension, and the head of the bone begins to move from its situation, that the cord should be cut through, or, by some mechanical means suddenly loosened, to permit the

snapping of the bone into its socket. I could never understand the *rationale* of this practice; for if the extension has been sufficient to draw the head of the bone anterior to the cavity, it certainly may be directed by the surgeon's hand safely into its natural position, the cords being at the same time gradually loosened; whereas the sudden removal of the force, might permit the more powerful muscles to draw the bone in such a situation as to produce a secondary dislocation. The snap is not always to be expected, nor can it well be, if the means which we have directed have been judiciously employed for any length of time; the surgeon therefore must not trust to that sign, nor make up his mind to continue pulling until he hears it, but he should rather look for the restoration of the natural form of the joint, as the mark of its reduction, which is indeed the only sign by which he can judge, while the apparatus is still applied; but so soon as he believes, from the alteration of the form, that the bone is reduced, the extension may be diminished, and enable him to examine if the affected limb has recovered its mobility, and is restored to its natural length; circumstances which can only occur with the reduction of the dislocation. The means that are to be employed to preserve the reduced limb in its natural situation, are to confine it in a perfect state of rest, and, as nearly as possible, if it be the upper or lower extremity, parallel with the long axis of the body, for in this position dislocation can hardly occur but by the application of a force sufficient to lacerate even the soft parts. Perhaps some constitutional means may be required to allay the inflammation which may follow the force that has been employed for reduction; the antiphlogistic regimen should always be recommended for a few days, in case of the continuance of inflammation in the injured joint, which, if neglected, might lead to its suppuration; a termination, which has, in some cases, followed violent force and the neglected after-treatment of reduction of a dislocation. The injured limb, after it has been reduced, should be allowed to remain at rest sufficiently long for the

reparation of the injured parts, otherwise very slight causes may produce the recurrence of the displacement;—a circumstance, which I have known happen in dislocation of the os humeri, from so slight a cause, that putting on a coat, and upon one occasion, jumping into the water, forced the head of the bone from the glenoid cavity of the scapula; but as the reduction required no more force than that which displaced the bone, the patient suffered little or no inconvenience, either from the frequency of the accident, or the means necessarily employed for its restoration.

When a dislocation has not been reduced, and the deformity has become permanent, either from the nature of the accident not having been discovered, or from the means employed for reduction being inefficient, the patient may yet derive some benefit from surgical aid; the motions of the new joint are to be encouraged, which usually lead to the formation of a very useful articulation. The whole limb, however, invariably wastes, principally from the diminished power of the muscles; indeed, the diminution, forms one of the most prominent features of the case.

Dislocations of the Lower Jaw.

The articulatory processes of this bone can only be displaced from the glenoid cavities in the direction forwards, and it is an accident most likely to be produced when the lower jaw is extensively depressed. It sometimes happens, that the displacement occurs only on one side; this has been termed partial or incomplete dislocation, but improperly so, as the articulatory surfaces are on one side separated, and forming therefore, a complete luxation; and besides, the term would lead one to believe that the condyle of the lower jaw was never partly displaced from its own articular cavity, a circumstance which does sometimes occur, and then leads properly to the denomination of a partial, or incomplete dislocation. That the lower jaw cannot be dislocated in any other direction than forwards, must be evident to the most perfect tyro in anatomy; and that no force can overcome the

resistance offered to the displacement of the lower jaw, backwards, or laterally, which is not sufficient to fracture either the jaw or skull. The ligaments of the lower jaw offer but little resistance to its luxation, or, I might say, even to its motions, but are more for the purpose of strengthening the synovial membrane, and communicating the influence of the muscles to the interarticular cartilage of the articulation.

In studying the anatomy and physiology of the temporo-maxillary articulation, it will be readily seen that the luxation of the lower jaw will be much more liable to happen from the influence of its own muscles, than from the application of any external force, unless, indeed, a blow be given at the time the mouth is widely open; yawning is one of the most frequent causes of luxation, particularly in persons of relaxed fibre; and it may be said that relaxation of this joint, indicated by its snapping during mastication, is a very strong mark of scrofulous diathesis.

There is no greater sign of the liability to dislocation in the lower jaw, depending upon the inordinate action of its own muscles, than the provision which nature has adopted to prevent this occurrence, at those early periods of life, when the infant mind is incapable of moderating muscular action. In infancy it will be found that the junction of the ascending, with the horizontal portions of the lower jaw, forms so obtuse an angle, as to prevent the condyles being projected forwards by any extent of depression,—an occurrence which would otherwise very frequently happen during the yawnings and cryings of a fractious infant. The diagnostic marks are sufficiently obvious to establish a clear judgment of this dislocation; the widely open mouth with loss of power to close it, the elevation of the angles, the unnatural flatness of the cheeks and temples from the stretching of the temporal and masseter muscles, the distinct empty space which may be felt immediately in front of the ear, and the dribbling of saliva from the mouth, are points too evident to escape the observation of the most cursory observer. These signs are all produced by the

condyles of the lower jaw having escaped from the glenoid cavities into the great zygomatic fossæ; where, indeed, the coronoid processes may be felt, immediately beneath the zygomatic arches, by examining with the finger in the mouth. While in this situation the condyles are still covered by their interarticular cartilages, which invariably follow the motions of the lower jaw, whether natural or inordinate. The pain which generally attends this accident, is principally attributable to the compression of nerves by the condyles, and the stretching of the muscles. It sometimes happens, that one condyloid process only is separated from the glenoid cavity of the temporal bone; in this case, the symptoms may be said to resemble the dislocation on both sides, excepting that none of them are so distinctly marked, neither are the two sides of the face symmetrical. This accident is generally produced by a blow on the side of the jaw when the mouth is widely opened; and Sir Astley Cooper has mentioned a case in which it was produced during violent vomiting from sea-sickness.

When from all these circumstances the surgeon's mind is decided as to the diagnosis, he may proceed to the necessary means for the restoration of the part to its normal state, which can only be effected by what is termed the reduction of the dislocation, and this is to be accomplished in the following manner:—The patient is to be seated on a low chair, when the surgeon standing in front, places his thumbs upon the molar teeth, the remaining fingers of each hand being placed under the horizontal portion of the jaw; he then presses with considerable force, so as to depress the whole jaw, and when by the continued application of this force, the surgeon finds that he has so overcome the power of the muscles, as to be enabled to depress the condyles below the zygomatic arch, he is then quickly to shift his thumbs between the cheeks and the teeth, when the muscles rapidly draw the jaw into its natural position. The reduction may also in some measure be assisted by the chin being raised by the index fingers of the operator, at the same time

that the thumbs are pressing down the condyles. It is usually advised that the surgeon should guard his thumbs with linen, to prevent their being bitten, but this is quite unnecessary, if the precaution which I have recommended, of slipping them between the cheeks and the gums, be taken, while at the same time the operator is more capable of judiciously employing his thumbs than when surrounded by folds of cloth. Pieces of wood are sometimes used by being placed on the molar teeth of the lower jaw, and then the chin raised, so as form a lever of the first order, the fulcrum being made by the portion of wood; cork has been sometimes substituted for wood, from being less liable to injure the soft parts, but its elasticity must, in my opinion, necessarily prevent the best application of the force. To employ these mechanical means to the best effect, a surgeon should understand perfectly the situation of the muscles under dislocation, and even of the different fibres of the same muscle; by which knowledge he is capable, at the period of the muscles yielding, to diminish their power of resistance by judiciously directing the dislocated bone towards its natural position. When the reduction is effected, it is indicated by the snapping of the bone, by the teeth of the two jaws coming in contact with each other, and by the disappearance of all the characteristic symptoms of the luxation.

The after-treatment consists in keeping the jaws in juxta position by the application of a bandage, which is to be worn for a longer or shorter period, depending upon the extent of separation of the two bones, and consequent injury to the soft parts; at any rate it is right for some days not to remove the bandage, but to feed the patient with such aliment as does not require mastication, and which can be conveyed to the stomach without depression of the lower jaw.

Sir Astley Cooper describes that peculiar relaxation of the ligaments of the temporo-maxillary articulation, which I have already spoken of as being indicative of scrofula, as *sub-luxation* of the lower jaw: I cannot, however, readily believe

that the interarticular cartilage is in these cases removed from the glenoid cavity, but that the snapping noise is produced from an altered state of the synovial membrane, depending upon some constitutional cause; and this, I am further induced to believe, as constitutional remedies almost invariably relieve the urgency of the symptoms. The shower-bath, with bark and valerian, are the best means to be adopted for these cases, and rarely fail in producing beneficial effects.

Several cases of dislocated jaw have occurred at Guy's Hospital, under my care, but as they are in general immediately relieved, they are scarcely ever admitted into the house, consequently no regular report has been kept. One case, however, occurred lately, the principal features of which may be worthy of relation. A patient in Stephen ward, while in the act of yawning, dislocated the right condyloid process of the lower jaw, as he was frequently in the habit of doing from any slight cause, as opening his mouth too widely in the process of mastification; it was always readily reduced, and the man suffered little or no inconvenience from this slight injury.

Dislocations of the Vertebræ.

The displacement of the articulatory surfaces of these bones without fracture, is an accident of very rare occurrence; it does, however, sometimes take place, and perhaps rather more frequently than is generally admitted. The symptoms are, however, so similar to those produced by displacement of the vertebræ from fracture, (when the spinal marrow is compressed,) that it will be quite useless to recapitulate what has already been said upon fractures of the spine. Boyer, when speaking of dislocations of the spine, has divided them into different sections, such as luxations of the head from the first vertebra, and luxations of the first and second vertebræ from each other; and has not only detailed cases in which the accident had occurred, but also, the means which were employed for their reduction. I have, however, no

experience in such cases, but his authority cannot for one moment be doubted, although I should have thought the dislocation of the atlas from the occiput impossible.

The case of Joseph York, (page 46,) will, however, prove that notwithstanding the number and breadth of attachment of the vertebræ with each other, their firm union by ligament and muscles, and the very slight degree of motion which exists between any two of them, still that the articulatory surfaces may be separated, and without fracture. In this case there was a complete laceration of the intervertebral substance, between the fifth and sixth cervical vertebræ, and the ligaments of the articular processes on one side were torn through, without any fracture. The displacement, however, of the bones was so slight, as not to have produced any apparent compression or lesion of the spinal marrow, although the symptoms were so urgent.

A case is also related in the Medical Gazette, dated the 22nd of January, 1831, of a man who was brought into the London Hospital, labouring under all the urgent symptoms of compression of the spinal marrow, from a supposed fracture of the spine. He died on the day of his admission, and but a few hours after the infliction of the injury; when it was found upon examination of his body, that the fifth and sixth cervical vertebræ were widely separated from each other, and without any fracture having occurred; the displacement, indeed was so great, as to have produced a complete disorganization of the medulla spinalis at that part.

The suddenness of the death of this individual is rather extraordinary, as there are several cases on record of persons having survived injury to the spinal marrow at this point for three or four days, although paralysis seemed complete, and the respiration carried on entirely by the diaphragm. It would lead one therefore to infer that the injury is quickly fatal in proportion to the degree of destruction of the spinal marrow; and that although the power of motion may be entirely destroyed, still when the injury is less extensive, a sufficient degree of nervous influence seems to sustain

vitality, for a period, commensurate with the extent of lesion. In displacement of the bones of the vertebræ, whether from fracture or dislocation when the spinal marrow is injured, the prognosis is always unfavourable, and the period of dissolution depends upon the proximity to, or distance of the injured part from the brain.

As to the treatment, it is precisely the same as that which has been recommended in fractures of the spine; no means can safely be employed for the coaptation of the displaced bone, and all the surgeon can do, by every kind attention to the patient, is to alleviate his bodily sufferings, and to sooth his mental anxieties. Boyer has indeed mentioned the case of a lawyer, who was writing at his desk, and turning his head quickly round, was not able to bring it back again to its former position, his head being permanently fixed to the right, and slightly inclined to the shoulder of that side; the sterno-cleido mastoideus muscle was in a state of relaxation, but the deformity is described to have been less than in those cases of spasmodic action of the sterno-cleido mastoideus, which not unfrequently occur. The diagnosis, however, was clearly of dislocation in this case, from the sudden manner in which the injury occurred; but as the spinal marrow was evidently not compressed, from the absence of all symptoms, no means were attempted to reduce the dislocation, and this patient was seen by many surgeons in Paris. "If, however," says Boyer, "there be slight numbness, or any symptom indicating compression of the spinal marrow, or if the patient be very anxious that means should be adopted for the reduction of the dislocation, it is to be attempted in the following manner:—The surgeon is to place his patient upon a low chair, and begin by inclining the head to the side towards which it is directed, in order to disengage the articulatory process of the upper vertebra; this part of the operation is extremely dangerous, as it is more than probable that in performing it, you may compress the spinal marrow, and the patient fall dead at your feet; but if you succeed, directly the articular process is

disengaged, the head may be brought into its natural situation, by performing a slight rotatory motion in the contrary direction to that in which the head was fixed by the luxation." If the spinal marrow was not affected, I should deprecate any attempt being made at reduction of this dislocation, and no desire of the patient, however urgent, could induce me to attempt it; but if injury to the spinal marrow was indicated, I then consider that the attempt at reduction is warrantable.

From the history of the following case, it is difficult to judge whether the injury to the spinal marrow occurred from dislocation or fracture. I shall therefore detail the circumstances as communicated to Sir Astley Cooper, by Mr. Greenwood of Horselydown.

CASE.

Mary Vincent, aged 47, in the act of raising a turn-up bedstead, when above her head, let it slip from her hand, and it fell upon the back of her neck: this occurred on the 26th of July, 1826. Mr. Greenwood describes that he did not see the woman until eleven days after the accident, at which time he found her labouring under a considerable difficulty of breathing, which was almost entirely carried on by the action of the diaphragm and abdominal muscles; there was also a general diminution of the muscular power, but no actual paralysis, except of the intercostal muscles. The patient complained of pain at the seat of the injury, which seemed to be about the situation of the fifth and sixth cervical vertebræ, at which point there was a slight depression, and pressure here produced universal paralysis, as indeed did coughing or sneezing. About three weeks after the accident, supposing herself sufficiently well to have her clothes changed, she attempted to move for that purpose, when immediately her right arm and hand became paralyzed. This woman lived until Friday the 10th of November, a period of fifteen weeks and six days, and her death seemed then to be the result of the impaired state of her digestive organs; as loss of appetite, constant sickness, and frequent purging were her most urgent symptoms. Mr. Greenwood mentions that it sometimes happened that the purging was so violent as to reduce her into what he considered rapidly approaching dissolution, when by administering stimuli, she in a very few minutes, rallied in a most extraordinary manner. There was no opportunity of examining this patient after death.

On taking a retrospective view of this case, the length of time which the patient survived the accident, must offer an important point for consideration, as it is clear that the spinal marrow was affected; but whether the compression was produced by the pressure of bone, either from fracture or dislocation, or from the effusion of blood or serum, is not so obvious; particularly as the surgeon, who was not called to the patient for eleven days after the accident, does not describe, whether the paralysis of the intercostal muscles was immediately the result of the blow. As, however, no mention is made of the tympanitic state of the abdomen, of the loss of power of retaining the fæces, or of the retention of urine; and further, from the protracted period which was allowed to pass before medical attendance was sought, as well as the length of time which the patient survived the injury, are all circumstances which lead me to consider that the injury to the spinal marrow was rather induced, than immediately produced, by the blow. I mean, that if it occurred from the displacement of bone, that the displacement was so slight as to lead to inflammation of the meninges of the spinal marrow, and to produce the ill effects which followed, either from congestion of the blood-vessels, effusion of serum, or, perhaps, the deposition of adhesive matter. Under such circumstances I should recommend cupping, occasional application of leeches, blistering, and perfect rest, as the local means to be employed; at the same time, paying attention to all those circumstances the most likely to preserve the powers of the constitution.

Dislocations of the Ribs.

Sir Astley Cooper, in treating on this subject, begins by saying, "Authors describe different species of dislocation of the ribs, their heads are said to be thrown from their articulations with the bodies of the vertebræ," an accident which must be very difficult of detection. The little liability of these bones to luxation must be obvious, from the numerous ligaments which serve to connect them with the

vertebræ, and from the improbability of any force being applied to one rib, without its fracturing the bone; while if the same force be extended over several, the extent of mobility they enjoy, from the physical property of their cartilages, almost precludes the possibility of their displacement. From distorted spine, however, or from any disease which affects their ligaments, or the other structures of these articulations, I can conceive a dislocation may occur; indeed, the following fact proves that the head of a rib may be separated from the bodies of the vertebræ, unattended by disease.

Mr. Webster, a surgeon at St. Albans, upon examining a patient of his, who had died from the effects of fever, found the head of the seventh rib thrown upon the front part of the corresponding dorsal vertebra, and was there anchylosed. Upon enquiry Mr. Webster learnt that this gentleman, several years before had been thrown from his horse across a gate, for which accident he had been subjected to the treatment usually followed in fracture of the ribs; and there is every reason to believe that it was at that period that the dislocation was effected, and indeed such is the treatment which must necessarily have been employed, had the nature of the injury been then ascertained. The attachment of the cartilages to the sternum, and to the bodies of the ribs, also sometimes yield, either from the pressure produced by distortion of the spine, or a violent jam; whether such displacement is to be considered as dislocation, fracture, or contortion, the effects and treatment are similar; and the only means by which the surgeon can relieve the symptoms, are to improve the general state of the patient's health, especially if produced by a distorted spine, when gentle exercise is to be employed to induce the healthy action of the defective muscles, which, as they become invigorated, will assist in restoring the spine towards the centre of gravity. But if the displacement of the cartilages be produced by external injury, bandages with compresses, and the antiphlogistic treatment, are to be employed precisely in the same manner as in fracture of the ribs.

CASE.

A baker's boy applied for relief at Guy's Hospital, who was the subject of displacement of the cartilages of the fifth and sixth ribs, from their articulatory surfaces of the sternum, produced by the constant action of kneading bread; this was attributable partly to the action of the pectoral muscles, but principally to the defective constitution. I stated to the boy the necessity of changing his occupation in life, recommended him to seek some employment in the country, and ordered him some tonic medicine. As, however, he was obliged to continue in his situation, little hope could be entertained of his recovery.

The portions of the sternum are liable to displacement from each other, from circumstances very similar to those already described. In speaking of the fractures of this bone, I related a case of separation of the first from the second piece, in which coaptation was spontaneously produced in a fit of coughing: whether this was to be considered fracture or dislocation, is very difficult to decide; but as the diagnosis does not interfere with the prognosis, it is a matter of but little importance.

Dislocations of the Clavicle.

From the comparative thinness of this bone to its length, from the little protection it derives from soft parts, and from its frequent exposure to external violence, from the peculiar manner in which it is placed between the shoulder and the sternum, it much more frequently happens that the clavicle is fractured, than that its articulatory surfaces are separated, either from the scapula, or sternum. Another circumstance which renders the dislocation of this bone rare, is the slight degree of mobility which it possesses in either of its articulations, and that only depending upon the motions of the scapula; so that the sterno-clavicular articulations might almost be properly classed, as amphiarthrodial joints, being partly obedient to the application of a force, communicated by the whole of the upper extremity, and partly only, under the influence of voluntary muscles. Thus, for instance, by the action of the trapezius and sterno-cleido mastoideus

muscles, we can voluntarily slightly raise the clavicle, yet, under the various motions of the scapula, no power of volition can prevent the clavicle being reciprocally influenced by the motions of that bone. Hence it is, that dislocations occur so seldom to the clavicle, in proportion to its degree of mobility; for instead of being provided with that support, which the muscles of the diarthrodial articulations afford them, it is rendered peculiarly strong by the number and size of its ligaments; and is also always equally capable of sustaining the same force, without the displacement of its articulatory surfaces. On the contrary, a diarthrodial articulation is most liable to luxation, when force is applied to it without the muscles being prepared, either by the consciousness of the person receiving the blow, or when in the semiflexed position, they are incapable of giving strength and support to the articulation; it may be said, therefore, that great strength is afforded to the moveable joints by the vital influence of the muscles, while the amphiarthrodial and synarthrodial articulations derive their security, principally from the physical property of their ligaments. The former being liable to dislocation when the muscles, either from unconsciousness, or position, are unable to afford their power of defence, while the two latter, are under all circumstances, almost equally capable of resisting injury. In treating of the dislocations of the clavicle, they are to be divided into its displacement from the sternum, and acromion process of the scapula.

Dislocations of the Clavicle from the Sternum.

The clavicle may be thrown in three directions from the sternum, upwards, forwards, and backwards; the luxation upwards is induced by the forcible depression of the scapula, —that forwards, by the scapula being carried in a contrary direction,—while its displacement backwards, is produced by the inordinate forcing of the scapula forwards. The dislocation forwards is the most frequent, in consequence of the inclination the clavicle takes to be connected with the scapula,

as well as the more extensive motion of the scapula itself, in the direction backwards, tending to force the sternal extremity of the clavicle through the anterior sterno-clavicular ligament.

The usual exciting cause of this accident is the application of a force upon the shoulder, when the arm is carried to its fullest extent backwards, and the articular surface is forcibly driven through the anterior ligament upon the fore and upper part of the sternum; and this is more likely to happen when the head is bent forwards, as the sterno-cleido mastoideus muscle in that position offers less protection to the articulation. The diagnosis in this accident is very easy, in consequence of the dislocated or displaced bone forming a projecting circumscribed tumour, admitting of the particular form of the articular surface being felt through the skin, which is nearly all that covers it. The upper extremity having lost its fulcrum, the shoulder falls towards the chest, and the patient is no longer capable of raising his arm to his head. I have seen several such cases, and in all, the diagnostic marks readily led to the explanation of the injury, which could only be mistaken for fracture of the clavicle, and then only by a cursory observer; as the absence of the projecting sternal extremity of the fractured bone, and the impossibility of removing the deformity by the raising of the elbow, which can so readily be accomplished in fracture, render the distinction at once obvious. A case of this kind applied at the Hospital a few weeks ago: the accident had occurred to a man in a state of intoxication, who pitched forwards and fell with the point of his shoulder upon the edge of the curb-stone; the displacement, however, was not complete, as a portion only of the articular surface of the clavicle projected through the anterior ligament. In this case, there was no loss of the width of the shoulder from its approximation to the side, and, indeed, none of the symptoms were so well marked as when the sternal extremity of the clavicle is perfectly displaced. The hard circumscribed tumour, however, on the upper part of the sternum and the impaired motion of the affected upper extremity, led to the discovery of the injury.

The treatment in these cases is the same as in fractures of the clavicle, namely, the application of a large cushion in the axilla, so as to form a fulcrum, and by confining the elbow close to the side, the scapula, and clavicle with it, are carried outwards, so as to enable the surgeon by the application of a compress, composed of a peice of cork surrounded by lint, to press the sternal extremity of the clavicle backwards into its situation. Thus, the coaptation may be readily effected, but contrary to the general rule laid down with respect to dislocations, the difficulty in these cases is to maintain it; and not all the attention of the surgeon can prevent some slight degree of permanent prominence on the affected side. An apparatus has been recommended, somewhat similar to a tourniquet, for the purpose of applying a force immediately upon the projecting bone; whatever be the means adopted, it is necessary to employ them for a considerable length of time, to permit of the reparation of the different structures of the articulation.

If from external violence the scapula be driven forwards, so as to impel the sternal extremity of the clavicle against the posterior sterno-clavicular ligament, with a force which it is incapable of resisting, and at the same time tearing through the costo-clavicular ligament, then the articular surface of the bone is driven behind the upper extremity of the sternum; the width of the shoulder must be immediately lost, the motions of the upper extremity impaired, a deep depression instead of prominence marks the position of the sterno-clavicular articulation, and superadded to these symptoms, the functions of respiration and deglutition are affected by the pressure of the head of the bone against the trachæa and œsophagus. The strength, however, of the ligaments, and the little extent of motion which the scapula enjoys in a direction forwards, precludes almost the possibility of such an accident occurring from external violence. Sir Astley Cooper, however, mentions at p. 370, in the fifth edition of his Treatise on Dislocations and Fractures, a case of this kind, which was produced by the gradual pressure

of the clavicle inwards, arising from a distorted spine; the progressive distortion occasioned such projection inwards of the clavicle, as to occasion extreme difficulty of deglutition, and as every means but removal of a portion of the displaced bone were considered ineffectual, Mr. Davie, the surgeon under whose care the patient was placed, proceeded to the following operation.—An incision was made of from two to three inches in extent on the sternal extremity of the clavicle, in a line with the axis of the bone and its ligamentous connexions, being divided, he sawed through the clavicle one inch from its sternal extremity, having introduced a peice of stout leather behind the bone, while he divided it with Hey's saw. The difficulty which occurred in the operation was in the division of the interclavicular ligament, which he was obliged to tear through, using the handle of his knife as an elevator, when he was enabled to remove the detached portion of bone. This patient lived for six years after the operation, and recovered from the emaciation which had been produced by the dysphagia. The result of this case proves the propriety of removing the pressure from the œsophagus, but whether the operation which was performed, was the best to effect this object, I must beg leave to question. Would not the same happy result have followed, by removing a portion of the centre of the clavicle, which would have equally prevented pressure on the sternal extremity of the bone, and consequently on the œsophagus, without leading to all the dangers which must have presented themselves in dipping down behind the sternum,—a situation, perhaps, of all others, the most formidable for surgical operation.

By violent depression of the shoulders, the sternal extremity of the clavicle is described as being liable to dislocation from the tearing through of the inter-clavicular ligament. The kind of force which I should consider most likely to produce this accident, is the attempt to raise two weights, suspended in a similar manner as pails are carried, and those weights being beyond what the strength of the person would

enable him to move, a yielding of the capsular and interclavicular ligaments of the sterno-clavicular articulation is liable to be produced.

I have never seen this accident, and am led to believe, upon consideration, that it can hardly be presented to the inspection of a surgeon; for, although this dislocation might be primarily produced by such a cause as I have mentioned, still I cannot understand how the displaced clavicle can remain in a situation above the sternum, as it would be drawn downwards upon that bone by the action of the pectoralis major muscle.

Dislocation of the Scapular Extremity of the Clavicle.

This accident I have seen much more frequently than the displacement of the sternal extremity of the bone; but taking an anatomical and physiological view of the two articulations, it would be difficult to judge which joint would be considered most liable to luxation; the simultaneous motion of the acromial extremity of the clavicle with the scapula, the slight degree of mobility of this articulation, the strength of its own ligaments, aided also by the coraco-clavicular ligaments, give at once the appearance of an equal protection against injury at this articulation, as at the sternal. To prove that there is great difficulty in estimating the comparative liability of the two joints to dislocation, Sir Astley Cooper commences the section appropriated to this subject, thus, "This accident is more frequent than the dislocation of the sternal extremity;" while Boyer has it, "These luxations are less frequent than the former," alluding to the sterno-clavicular articulation. As I have before said, I consider the acromial extremity more frequently the subject of displacement than the sternal.

The form of the articulatory surfaces of the portions of bone entering into the formation of the acromio-clavicular articulation, is such, as to lead to the displacement of the clavicle upwards on the acromion, the direction in which the acromial articular face tends. This displacement is usually

produced by a fall from a considerable height upon the point of the shoulder, which has a tendency to drive the scapula downwards and inwards towards the ribs; while, at the same time, the violent involuntary inspiration induced by the sensation of falling, draws the clavicle upwards, producing a sliding of the two oblique articulatory surfaces of the joint upon each other, tending to admit of their separation, the trapezoid and conoid ligaments being at the same time torn through, as well as the superior and inferior ligaments of the acromio-clavicular articulation.

The existence of this dislocation is easily ascertained, not only from the superficial situation of the displaced portion of bone, but also from the impaired motion of the extremity, and the intolerance which the patient expresses at any attempt to move the limb, as it calls into action the deltoid and trapezius muscles, which, influencing the displaced bone, produces considerable pain. In speaking of the action of the trapezius muscle, tending to the displacement of the clavicle from the acromion, it may be asked by the student, if the attachment of the deltoid would not counteract the influence of the trapezius? the answer is, that the contraction of the trapezius, occurs through the stimulus communicated to it by its respiratory nerves, a function in which the deltoid performs no part; therefore it is to be remembered, that it is not merely the attachment of a muscle which comprehends all the science of its use, but the different sources through which it gains its nervous influence, is a subject of the greatest importance. In the many cases of the dislocation of the clavicle which I have seen at the scapular extremity, they have all occurred in the direction upwards, and have each exhibited the diagnostic marks indicating the nature of the accident; the only remark which I have to make worthy of notice, as the result of experience, is, that it is generally very difficult to produce coaptation, and still more difficult to maintain it. The mode of producing coaptation is similar to that described in the dislocations of the sterno-clavicular extremity, and in fractures

of the clavicle, namely, the placing a cushion in the axilla; but upon bringing the elbow to the side, in these cases, great difficulty occurs in carrying the scapula outwards from the clavicle, probably in consequence of the manner in which the trapezius and deltoid muscles connect the two bones with each other; and this difficulty is proportionate to the length of time the accident has occurred. When by continued attempts the articulatory surfaces of the bone are brought into apposition, a fresh and equal difficulty arises in inventing means to prevent the recurrence of their displacement. The prognosis, therefore, is to be considered as very unfavourable, particularly when we contemplate the apparent unimportance of this accident, and the patient leaves your care dissatisfied from the impaired motion of the affected limb. I have found, however, that although the deformity remains but little altered by time, still the patient regains a considerable degree of motatory power, and ultimately suffers little or no inconvenience. This change must take place, I suppose, from the formation of a new arthrodial articulation, although I have never had an opportunity of examining such an injury after death.

I have not seen the clavicle thrown under the acromial process of the scapula, neither do our best authors upon the the subject describe it as having occurred in their practice, it would be useless therefore to dwell upon its indications.

Dislocations of the Os Humeri.

It has certainly occurred, during my connexion with Guy's Hospital, and is generally admitted, that the humerus is more frequently dislocated than any other bone in the body, if it does not also verify the assertion of Boyer, "that the frequency of luxation of this bone, equals in number that of all the other bones collectively." The liability to this accident is attributable, not only to the extent, but also to the variety of the motions of this articulation. The form of the glenoid cavity, and the articulatory surface of the head of the humerus, if examined upon the dry bones, would involve a

mystery in the mind of the student, how in a state of motion they were to be kept in apposition; and even in the progress of his anatomical studies, when examining the attachment of the ligaments of this joint, he will still think the capsular ligament, and the fibro-cartilaginous rim of the glenoid cavity, but ill calculated to prevent the displacement of the articulatory surfaces of the two bones from each other; but in progressive advancement, when studying the muscular system, and investigating those of the shoulder-joint, he will find that they not only arise from one of these bones to be inserted into the other, but that their tendons and their fibres are frequently inserted into the capsular ligament, and through the medium of it, or sometimes actually passing through, become imperceptibly lost in the fibro-cartilaginous rim of the glenoid cavity, so, in fact, as to form the ligamentous part of this structure. Thus then we find, that these muscles are not only destined to move bone upon bone, and to vary the direction of these motions, but also, at the same time, to fix all the structures of the joint simultaneously to the motions of the articulation. It is on this account that dislocations occur from such slight causes,—when a person is in a state of intoxication, and his muscles therefore rendered incapable of voluntary action, compared to the force which is necessary to overcome their power, when naturally exercised to protect the joint from injury.

I have had several opportunities of witnessing the dislocation of the humerus in the three different directions, which are usually described, namely, downwards into the axilla; downwards, forwards, and inwards, upon the venter of the scapula; and backwards and outwards upon the dorsum. The second of these dislocations, is described by Sir Astley Cooper, as a luxation forwards, upon the pectoral muscle, when the head of the bone is placed below the middle of the clavicle, and on the sternal side of the coracoid process of the scapula. For my own part, I have never seen a dislocation of this kind, where the head of the bone was thrown

upon the inner side of the coracoid process of the scapula, and upon the digitations of the serratus magnus muscle; yet the diagnostic marks of the dislocation I intend to describe, accord completely with the account given by Sir Astley Cooper, of the dissection of an unreduced dislocation of this sort, in which "the head of the bone was thrown on the neck and part of the venter of the scapula, near the edge of the glenoid cavity, and immediately under the notch of the superior costa, nothing intervening between the head of the humerus and scapula, as the subscapularis was partly raised from its attachment to the venter." The cases which I have seen, have been more difficult of detection than dislocation into the axilla; the head of the bone being deaper seated, and more imbedded in soft parts.

Of the three kinds of dislocation to which the humerus is liable, that downwards into the axilla is the most common, that forwards and inwards the next in frequency, and the dislocation backwards and outwards upon the dorsum of the scapula the most rare; three cases of which, however, I have myself seen. There is a fourth luxation spoken of by Sir Astley Cooper, termed a partial dislocation, in which the articular surface of the humerus glides upon the inner edge of the glenoid cavity, and rests upon the base of the coracoid process of the scapula. In such cases, I believe, the capsular ligament is not torn through, and that the partial displacement depends upon the relaxation of the muscles and ligaments, from some constitutional cause, requiring tonics, shower bath, and blistering, to prevent the liability of its recurrence.

Dislocation into the Axilla.

I shall first describe the diagnosis of this injury before I relate the cases. One of the most frequent causes of this accident is a person falling sideways with his arm widely separated from his body, and the elbow coming in contact with the ground, the head of the humerus is driven against the inferior part of the capsular ligament, when meeting

with resistance in that direction from the adductor longus, it is directed inwards with sufficient force to tear through the capsular ligament, between the triceps and subscapularis muscles. The patient immediately loses the motions of the shoulder, and more particularly that of circumduction, as the *point d'appui* to the head of the humerus is lost; and instead of being able to carry the hand to the head, the patient is forced to bring the head to the hand. Upon examination, the surgeon finds that the affected arm is longer than that of the opposite side, and does not maintain its vertical direction, being permanently fixed in an oblique position, so that the elbow is widely separated from the side, to which it cannot be brought; and in tracing the humerus upwards it leads you into the axilla, and not into the glenoid cavity of the scapula. On examining the two shoulders, to ascertain whether or not they are symmetrical, that on the affected side will be found so perceptibly flattened as to form a very prominent diagnostic feature in the case; while the acromion projects, so as to mark the empty glenoid cavity immediately below it, into which the surgeon's finger may be readily pressed.

On tracing the outer side of the humerus upwards from the elbow towards the shoulder, the bone on the healthy side offers the same resistance along its whole extent; but on the dislocated side, the upper part of the humerus no longer offers any support, and the fingers sink from the yielding to the pressure. There may be more or less pain concomitant with this accident, depending upon the extent of the displacement, and the direction of the bone, from which results the degree of injury to the axillary plexus of nerves. When all these signs present themselves, there can be no possibility in mistaking the nature of the injury; and indeed, if from the stout form of the individual, the flatness of the shoulder, and the direction of the bone, it be not decidedly conspicuous, still, the loss of motion, the permanent separation of the elbow from the side, and the lengthening of the limb, following as the immediate effects of external violence, must be quite

sufficient to enable the surgeon to form a just diagnosis. Some have described, that the head of the diplaced bone may be felt in the axilla; this examination can only be made with any hope of success, in very thin people, and is productive of great pain; as it leads therefore to no useful object, I hold it unnecessary to seek for this additional proof of dislocation. A patient, the subject of dislocation of the humerus being presented to your care, and having ascertained the fact, the first consideration should be as to the period since the diplacement occurred, so that you may judge of the propriety of attempting reduction; the prognosis being favourable, in proportion to the early period at which you have been consulted. If the patient be a strong muscular man, and the surgeon has determined on the propriety of reducing the dislocation, blood should be drawn from the arm through a free opening, the patient being desired, while in the erect position, to fix his eye upon some object on the ceiling; by these means, syncope is rapidly produced, and as it approaches, the patient should be extended along the floor, when the surgeon sitting by the side of the affected limb places the heel in the axilla, and taking hold of the patient's wrist, performs simultaneously, extension and counter-extension through the medium of his own muscular power, which being steadily kept up for a few minutes, the head of the bone usually snaps into its place. Should the muscular force of the surgeon prove inefficient to overcome that of the patient, a jack-towel may be fastened around the patient's wrist, so that the extending power may be multiplied by the force of one or more persons, the heel of the operator still remaining in the axilla. Sir Astley Cooper recommends that the extending force should be applied to the humerus, by which means he is enabled to flex the fore-arm, and consequently relax the biceps muscle, which he considers offers the resistance to the reduction of the dislocated bone.

Anatomy and physiology appear equally to substantiate this opinion; but in my practice I have not succeeded so

well in the adoption of this plan, as by making extension from the wrist-joint. It sometimes happens, however, that from the great muscular strength of the patient, and from the length of time which the luxation has occurred, that it may be considered necessary to employ the pulleys as the mode of applying the force, which may be adjusted in the following manner:—Having first bled the patient, and used those constitutional means which have already been described as necessary to overcome muscular action, the patient should be laid in the recumbent posture upon a table of convenient height, placed between two staples screwed into the wall; to one of these is to be fastened the extremity of the apparatus which is employed for the purpose of perfectly fixing the scapula; and this is best done, either by putting the arm through a hole in the centre of a long round towel, while the opposite extremity of the loop is to be fastened to one staple, or the same object may be effected by means of a padded leathern strap, having an opening made in it to admit the arm. The fore-arm of the affected limb is then to be bent to a right angle with the upper, when above the elbow-joint a girth is to be buckled around the arm, and furnished with a strap on either side, with a ring fixed to each, for the purpose of being attached to one of the pulleys, the other pulley being fixed to the opposite staple. This apparatus should be so firmly fixed, and every means employed to maintain its adjustment, that by no chance it may be rendered necessary to release the muscles from the influence of the extension, until the dislocation is reduced.

When the apparatus is thus applied, the surgeon should commence the extension through the means of the pulleys, and continue gradually drawing them tighter and tighter, until the muscles are well put upon the stretch; this degree of extension should be continued unremittingly for five or six minutes, when again further extension may be made; and thus step by step, force is to be applied, until the muscles have sufficiently yielded as to remove the dislocated bone

from its new situation. Should the surgeon himself not possess sufficient strength to overcome the muscular action of his patient, he should obtain assistance, taking care that this additional force be employed in the same gradual manner. The extension should be made in the direction of the long axis of the displaced bone, when first applied; but so soon as the surgeon perceives that the dislocated bone is removed from its new situation, he should give the pulleys to the care of an assistant, while he, himself, is to direct the head of the bone into the glenoid cavity, to perform which, it is generally necessary to change the direction of the extending force. The evidence of the dislocation being reduced, is the perfect restoration of the natural form of the joint, as well as its mobility; its snapping into the socket is not to be expected, when the pulleys are used, for by them the force is so gradually employed as completely to tire the muscles, and therefore prevent that spasmodic contraction which induces the snapping noise. Immediately the reduction is effected, the arm should be confined to the side and placed in a short sling, so as to permit of the reparation of the soft parts of the articulation. I have already mentioned, if the dislocation has occurred for any length of time, that the warm bath, bleeding, or tartarized anatomy, should be employed to overcome the muscular action, and render less mechanical force necessary. Other means, besides the heel in the axilla and use of the pulleys, have been recommended by some surgeons, as the knee in the axilla, the mechanical apparatus termed the "Ambe," and the patient holding a weight for a sufficient time, to overcome the power of his muscles. In my opinion, however, little hope can be entertained of reducing a dislocated arm, after the heel in the axilla, and the pulleys have failed.

I shall only mention a few cases of the dislocation of the humerus into the axilla, as it is an accident of such frequent occurrence, that to enumerate the many opportunities I have had of witnessing the efficacy of the practical application of the principles just laid down, could answer no useful purpose.

I think I may say, that twenty dislocated humeri, in the year, are reduced in the surgery by the dressers with the heel in the axilla.

CASE.

Thomas Edwards, aged 48, a sawyer, was admitted into Guy's Hospital, in consequence of a fall into the saw-pit, by which accident he so injured his shoulder as to consult a surgeon, who told him that he had merely sprained the joint; he then applied to a bone-setter, who immediately understood the nature of the accident, but was not so lucky in his attempts at reducing the bone, which he pronounced to be dislocated. Not until the end of six weeks did he apply to the Hospital; and happening to be at Guy's at the time, I examined the shoulder, and immediately found all the diagnostic marks of dislocation into the axilla complete, such as flattening of the shoulder, projection of the acromion, with a depression immediately under it into which the finger readily sunk, the oblique direction of the extremity and the long axis of the bone, when examined from below upwards, leading into the axilla, and not into the glenoid cavity. As he was a very strong muscular man, I ordered him two grains of opium; and in two hours after, when the narcotic effects commenced, I had him bled in the erect posture to approaching syncope; and in this state he was carried to the operating theatre, where I placed him in the recumbent posture upon a table conveniently fixed between the two staples, which are permanently fixed in our theatre. The apparatus for applying the extension and counter-extension being firmly attached, the pulleys were employed, the power being gradually increased for forty minutes, but without succeeding in restoring the bone to its natural situation, although I placed my knee in the axilla, and with a towel passed around the arm, attempted to elevate the depressed bone. I therefore discontinued the extension, fastened a handkerchief around the patient's wrist, and sitting by his side, placed my heel into his axilla immediately upon the head of the bone; when making extension, assisted by one or two persons through the medium of the handkerchief, in a few minutes, as much by pushing with the heel as by drawing from the wrist, the bone slipped into the glenoid cavity. The arm was confined to the side, and in about three weeks he left the Hospital, with the function of the joint nearly restored.

I have mentioned this case, because it illustrates well, the much more favourable manner in which the force may be applied, by means of the surgeon's heel in the axilla, than by the pulleys, although the power of the latter must be so much greater.

CASE.

William Fisher, aged 62, a stout and muscular man, by trade a shipwright, was admitted into Guy's Hospital, on the 8th of April, with a dislocated humerus. He stated that he fell down about five weeks ago, and pitched upon the top of his shoulder. Upon rising, he found he was unable to lift his arm to his head, and applied, therefore, to a surgeon, who told him "the bone was severely shook," and gave him an embrocation to rub the shoulder with, applying at the same time a bandage. In a short time the hand and fingers began to swell, and to be affected with a tingling sensation, for which leeches were ordered, and they in some measure mitigated the urgency of these symptoms. The limb, however, not becoming more useful, and the means employed not proving of any service, he applied at Guy's Hospital for relief at the expiration of a month and four days from the time of the accident, when the following signs of dislocation of the humerus into the axilla presented themselves. The right shoulder was much flattened, and upon examination a distinct depression was found immediately below the acromion; the elbow was widely separated from the side, and the long axis of the humerus was directed upwards into the axilla, where the head of the bone could be felt, directed rather forwards under the edge of the pectoral muscle; the hand and fingers were much swollen and œdematous; any rotatory motion of the humerus was difficult, and attended with considerable pain; from the protracted period since the accident, from the great muscular power of the patient, and from the fixed position of the dislocated bone, it was deemed advisable to use the pulleys, at the same time reducing his muscular efforts by frequent small doses of tartarized antimony; the patient obstinately refusing to be bled. He was then placed in the horizontal position, and the scapula being fixed, by the affected arm being placed through a padded strap, which was firmly secured to one staple, gradual extension was made outwards and downwards, and kept up for fifteen or twenty minutes, when the humerus might be felt drawn from its new situation; the pulleys were then slackened, and the arm forcibly and quickly carried forwards, when it slipped in, but without making any snapping noise. The elbow was then bound to the side, and the forearm resting in a short sling; some slight degree of inflammation of the shoulder followed these means of reduction, and a stimulating liniment was employed, which succeeded in subduing the pain. From this time, the swelling of the upper extremity gradually decreased, and in about a fortnight he left the Hospital, although still unable to perform any useful motion of the joint, he however, ultimately perfectly recovered the use of the limb.

CASE.

A gentleman from Monmouth, a short and very stout man, consulted me, in consequence of an unreduced dislocated humerus, which had been displaced three months. All the usual signs of dislocation into the axilla were evident, the strongest diagnostic mark, however, being the distance which the elbow was removed from the side; and even at this remote period from the accident, leading me to believe that the head of the bone was thrown forwards and inwards upon the venter of the scapula. Upon examining the glenoid cavity, by pressing my finger in the depression under the acromion, I could discover that little or no alteration had taken place in this articular surface, and considered therefore, that if the reduction could be effected, the joint would be restored to its natural function. I proposed to him therefore to submit to those means which I might consider necessary to employ, and to which he readily consented. I first, having in his own room adjusted all the means necessary for the employment of the pulleys, bled him to twenty ounces, and having reduced him to a state approaching to syncope, by frequent small doses of tartarized antimony, I placed him in the recumbent posture upon the table, and applying the extending and counter-extending forces, in the manner which has already been described, gradually continued the power of the pulley until it amounted to that of six men. While under this discipline he seemed to recover from his fainting state, I therefore ordered the vein to be again opened, and took ten or twelve ounces of blood from him; the extension was applied for nearly an hour, when the head of the bone seemed to become obedient to the power, and placing my heel in the axilla, at the same time gradually loosening the pulleys, and drawing the arm over the patient's body, the bone snapped into its place. Frequently during the extension being made, I addressed myself to the patient, keeping up a kind of conversation with him, and he afterwards told me that he could distinctly feel he lost all voluntary power over his muscles, immediately he was obliged to maintain the dialogue, and that the necessity of conversation seemed to reduce him more than even the administration of the antimony.

The principal point in this case, was to determine, whether or not, after the length of time the bone had been displaced, it would be right to attempt reduction; for upon examination, I was not enabled to detect any such change in the organization of the parts, as to give me reason to believe that the joint would be unable to perform its natural function,

if the articular surfaces were again brought in coaptation. I determined, therefore, to make the attempt, in which I fortunately succeeded.

Dislocation of the Humerus, forwards and inwards, upon the Venter of the Scapula.

In this dislocation, the head of the humerus is placed underneath the coracoid process of the scapula, between the subscapularis muscle, and the venter of the bone; and under common circumstances, there is little or no shortening of the limb; but the grand diagnostic mark, is, the wide separation of the elbow from the side, and the oblique direction of the whole of the affected extremity outwards and backwards. If this dislocation, however, remain but for a few days unreduced, a considerable degree of shortening occurs, by the action of the pectoralis major muscle, which draws the head of the bone upwards, towards the notch of the scapula, and immediately below the clavicle; here, in thin persons, the head of the bone may be felt, but yet must necessarily be covered by the pectoralis major, pectoralis minor, and subscapularis muscles, and not resting, as some have described, between the subscapularis, and pectoralis major. The degree of immobility of the limb in this dislocation is another strong diagnostic mark, and the only motion which can be produced, is backwards, in which direction the head of the bone meets with no other resistance than muscle.

The means of reducing this dislocation is similar to that employed for the reduction of luxation into the axilla, excepting that the extension is to be made first more out wards and downwards, until the head of the bone has cleared the coracoid process, when the surgeon placing his heel on the head of the humerus, forces it outwards and backwards, while he brings the whole of the upper extremity forwards; the force required is usually greater than in dislocation into the axilla, and especially if the accident has occurred long before the attempt at reduction has been made. The prognosis in these cases may altogether be considered as less

favourable than in the former dislocation, in consequence of the greater degree of violence necessary to produce displacement forwards and inwards.

CASE.

On the 17th of May, 1828, I was sent for to Suffolk Street, to a gentleman, who had been thrown from his horse, and received a severe injury to his shoulder, which upon examination, was readily discovered to be a dislocation of the humerus, forwards and inwards on the venter of the scapula. The grand distinguishing mark, was the great separation of the arm from the side, and the deep cleft of the soft parts, immediately underneath the glenoid cavity of the scapula, produced by the direction of the head of the humerus inwards, giving more the appearance of a fractured than a dislocated arm, but the immobility of the limb at once removed all doubt. Upon trying to feel the head of the bone in its new position, I could but very indistinctly discover any thing like a hard tumour; while the attempt to produce rotatory motion giving so much pain, with the wide separation of the arm from the side, the obliquity backwards, and the apparent shortening of the limb, all led me to the conviction, that the head of the bone was thrown forwards and inwards upon the venter of the scapula. Although this gentleman was an extremely muscular man, I did not seek the aid of any constitutional means to reduce his power, as he was already faint from the effects of the accident; I therefore immediately laid him upon the floor, and sitting on his left side (the affected side), I placed the heel of my right foot in his axilla, and assisted by Mr. Beck, a surgeon, I made extension from the wrist-joint, by preserving which, steadily for a few minutes, the bone slipped into its place with a snap, and being secured in this position in the usual manner, the patient ultimately recovered the use of the joint.

I have frequently seen cases of dislocation of the humerus, in which there was some difficulty in determining whether the head of the bone was thrown downwards into the axilla, or forwards upon the venter; and I believe, in such cases, that the head of the bone is placed midway between these two directions, upon the anterior edge of the inferior costa of the scapula, between the teretes and the subscapularis muscles. I have seen a preparation of an unreduced dislocation of this kind, in which a very efficient glenoid cavity was formed, and the person must have enjoyed a motion of

the limb, little inferior to the natural extent; this was further indicated by the slight diminution of the muscles, but I had no opportunity of acquiring any knowledge of the state of the individual previous to his death.

Dislocations of the Humerus backwards and outwards, upon the Dorsum of the Scapula.

Boyer, in speaking of this accident, says, "there is no well attested instance of dislocation of the humerus outwards and backwards;" and he goes so far as to reason upon circumstances, why it should not occur, because he observes "the tendon of the long head of the triceps opposes it." Notwithstanding, however, this authority, there are numerous of instances of its occurrence, and I have seen several cases. The diagnostic marks of this injury, are the loss of motion of the limb, the direction of the arm forwards and inwards, and a slight degree of pronation of the whole of the affected extremity; the natural roundness of the shoulder, may be described rather as being altered, than lost, as the flattening occurs only anterior to the acromion, where the skin is drawn into puckers or folds. On raising the arm to a right angle with the side, and tracing the long axis of the humerus, the eye is carried in a direction behind the glenoid cavity; and if the patient be thin, the head of the bone may be felt upon the dorsum of the scapula, on the fossa infra-spinata, between the bone, the teres minor, and the infra-spinatus muscles. But if the patient be stout, or the tumefaction resulting from the injury considerable, the diagnosis is often difficult, especially in consequence of the degree of motion, which the humerus retains in this accident; at least, so I found it in the following case, upon which I was consulted.

CASE.

Mr. G. a gentleman from Surrey, a very stout man, in the act of violently pushing a person from him, injured his right shoulder-joint, which led him to consult a surgeon, who did not discover the nature of the accident, but recommended him leeches, and all the means usually

employed for the restoration of a contused joint. As, however, the use of the limb continued impaired, so much so that he could not raise his arm to his head, he came to town to consult Sir Astley Cooper, who not being at home, he applied to me. Upon examination, I found so much tumefaction, that I could not discover the nature of the injury, and desired him to call the next morning, when, Sir Astley, raising the arm for the purpose of examination nearly perpendicular to the body, the head of the bone slipped forwards into the glenoid cavity, and thus the nature of the accident was made obvious, only by the reduction of the dislocation.

CASE.

In a few days after, it happened that a gentleman consulted Sir Astley Cooper as a morning patient, who was the subject of a similar accident, and in whom, the diagnostic marks were particularly clear; I, at the moment, was desired by Sir Astley, to write down the principal features.

The arm was directed inwards, towards the side, giving it the appearance of fracture, and looking as if so carried for support. The roundness of the shoulder had lost its natural appearance, and the skin was gathered into folds in front of the acromion process, which was preternaturally prominent. On taking a posterior view of the shoulder, it was impossible to trace the spine of the scapula, in consequence of a fulness, below and behind the acromion; and upon raising the arm, the tumour in the fossa infra-spinata moved obedient to the motions of the humerus, indicating the situation of the head of the bone; in tracing the long axis of which, the eye was directed behind the glenoid cavity of the scapula. We then tried to reduce the dislocation by slight extension, drawing the arm outwards, but failing in this attempt, Sir Astley Cooper, raised the limb perpendicularly, and at the same time forcing it backwards, behind the patient's head, the bone slipped into its place, being thus reduced, precisely in a similar manner to the last mentioned case. It was singular, that two instances of so rare an accident should occur so closely together, in the practice of one individual.

These cases I was constantly in the habit of mentioning, when lecturing on the subject of dislocation, and upon one occasion I received the following letter from an old pupil.

CASE.

My dear Sir,—Singularly enough, during your lecture of yesterday, while recapitulating the dislocations of the shoulder, and so fully describing the anatomy of the joint, I found, on my return home, that I had been sent for to an old woman sixty years of age, living in Hen

and Chicken Court, Fleet Street, who had fallen down in a fit. I immediately went to her, and found she had recovered from the fit, but complained dreadfully of pain in the shoulder, and of inability to move the arm. Upon a careful examination, which I was induced to make from its being so very different from what might have been expected from paralysis or neuralgic affection, I was soon led to infer that the articulatory surface of the humerus was thrown from the glenoid cavity of the scapula. Upon viewing the two shoulders, for the purpose of discovering the deviation from symmetry, it gave an appearance on the affected side, as if the glenoid cavity was thrown forwards, and rendered particularly prominent. The whole arm appeared shorter, and was directed forwards, but separated from the body, the head of the bone could be distinctly felt upon the dorsum of the scapula, producing a considerable tumour, and forming the grand diagnostic mark of the nature of the injury. I raised the arm perpendicularly to the body, in the manner I had just heard recommended by yourself; but not being successful in returning the head of the bone into its place, and the attempt in this manner causing such considerable pain, I desisted, and proceeded in the following manner:—The scapula being fixed, I made extension from the wrist in the direction of the displaced bone (without placing my foot in the axilla,) for two or three minutes, while my assistant was directing the head of the bone forwards from the dorsum of the scapula, and in this way it readily slipped into its place.

The coincidence of this accident with your lecture, is somewhat singular.

I am, my dear Sir, your's, &c.

2, *Fore Gate*, ROBERT DUNN.
St. Clement's Inn,

The want of success in reducing the dislocation by the means which have already been described, I would rather attribute to the want of strength in Mr. Dunn to raise the arm, than to believe that the perpendicular elevation is not the best mode for reducing the dislocated bone. I think Mr. Dunn was perfectly correct in not placing his heel in the axilla, as is recommended in other cases of dislocation of the shoulder, as I imagine it could scarcely be so placed, without impeding the return of the head of the bone into the glenoid cavity. I cannot, however, understand how the arm should have the appearance of being shortened, when it

must necessarily be lengthened by its new situation, although there is always great difficulty in appreciating the want of symmetry, between the two limbs, from the fixed state of the one injured, rendering it incapable of being placed in the most favourable position for comparison.

Partial Dislocation forwards.

I have no experience of this accident, and believe it is more frequently the effect of disease of the joint, or constitutional derangement, than of external injury.

Sir Astley Cooper, however, had a case occur to him, in a Mr. Brown, who was thrown from his gig; and, in pointing out the diagnostic features of the accident, describes that the head of the bone projected forwards and inwards against the coracoid process, but on its scapular side, while in the complete dislocation forwards, it is thrown to its sternal side, which may form the principal diagnostic mark between the two accidents. In the partial dislocation, the capsular ligament is not torn through, and the difficulty which occurs is less in reducing the dislocation than in maintaining coaptation.

When at St. Thomas's Hospital, I remember that Mr. Patey had an opportunity of dissecting a joint, the subject of this accident, in which case a new glenoid cavity was formed, partly from the coracoid process of the scapula, and partly from the inner edge of the original cavity. The reduction of such a displacement is effected by drawing the shoulders backwards, and by any means which can be employed to maintain them in that position.

Dislocations of the Elbow-joint.

There is no joint in the body which, under accident, requires more anatomical and physiological knowledge, than the elbow, to lead the surgeon to a just diagnosis, and particularly in dislocation, when, the force required to separate the bones must necessarily be so violent as to produce extensive tumefaction of the soft parts, and conceal the

relative position of the natural eminences of the joint, which alone can lead to a correct judgment of the injury. Swelling, pain, and loss of motion, are not the signs by which the true nature of the accident can be comprehended; but the inability of the joint to have its natural motions produced, and the change of position of the condyles of the humerus, with the olecranon process of the ulna, are the best indications of the displacement of the articulatory surfaces of the elbow-joint. Notwithstanding however the peculiar form of the bones which enter into this articulation, the strength of the muscles, and the number of its ligaments, still the articulatory surfaces are sometimes the subject of displacement; and the luxations of the elbow-joint may be classed under three different heads.—First, The radius and the ulna may both be thrown behind the humerus; secondly, the ulna may be alone thrown backwards; and thirdly, they may both be dislocated laterally.

Dislocation Backwards.

This accident most frequently occurs by falling from a height, or being propelled from a carriage or horse; when the hand being thrown forwards to protect the body, if it happens to come in contact with the ground in a state of supination, the weight of the body has a tendency to drive the humerus forwards, while the resistance the ground offers, propels the radius and the ulna in a direction upwards and backwards, behind the condyles of the humerus. The diagnostic marks of this accident are plain, in proportion to the degree of separation of the articulatory surfaces of the bones. A permanent state of semiflexion must always accompany this accident, and the attempt to extend the limb produces a considerable degree of pain; in fact, the fixed state of the joint is the grand characteristic of this, as of all other dislocations: besides, there is found a considerable hollow on each side of the olecranon, and anteriorly, a hard projection is found in the natural situation of the hollow of the elbow-joint, formed by the condyles of the humerus. On further

examination of this accident, and of the relative position of the olecranon, with the condyles of the humerus, we shall find the former elevated far above both, although naturally, it is placed on a plane, with the external condyle. It is said, that "this luxation may be mistaken for fracture of the olecranon, of the head of the radius, or even of the inferior extremity of the humerus;" but, does not the facility of restoring the bones to their natural position in fracture, and the difficulty of doing so in dislocation, point out sufficiently the distinction between the two accidents? In this luxation, the ligaments are so torn through, and the muscles so readily managed, from the perfect command the surgeon can obtain over the joint, that, in general, no great force is required to replace the separated articulatory surfaces, particularly if the attempt be made soon after the accident has occurred; but should there be, from any cause, a mistake as to the nature of the accident, it is not so irreparable as described by Boyer, who says, "that if the reduction be not effected before the end of fifteen or twenty days, it is impossible to accomplish it afterwards." I have seen Sir Astley Cooper reduce this dislocation three months after the accident, and have, myself, succeeded two months after the infliction of the injury, by bending the joint over the knee, and making extension both from the wrist and upper arm, while the knee is pressing the ulna and radius backwards.

When coaptation has been effected, indicated by the capability of the joint to permit of its natural motions, and the restoration of the olecranon process of the ulna, and the condyles of the humerus to their natural relative positions, the arm should be permanently confined in the semiflexed state, with the hand between pronation and supination, by the application of splints, so adjusted as to prevent the possibility of any motion, and thus it should be retained for ten days or a fortnight, when all inflammatory symptoms usually disappear, and passive motion may be commenced.

CASE.

James Chandler, aged 27, a labourer, stated that as he was getting out of his van, by placing one of his feet on the wheel, he slipped, with his left arm doubled under his side, but was not able to describe the precise manner in which the arm was placed. He walked home, and did not perceive any particular injury done to his arm, until he attempted to undress himself, when from the alteration in its form, he was alarmed, and applied to Guy's Hospital for relief. Upon his admission, the arm was found permanently semiflexed, and fixed in a position between supination and pronation of the hand; some slight degree of rotatory motion outwards could be produced, but not to the full extent; the tumefaction was so great as to prevent a very minute examination; but on placing the thumb on the head of the radius, it was distinctly felt to rotate, and its cup-like cavity could be distinguished above the external condyle in its natural position, with respect to the lesser sigmoid cavity of the ulna. Thirty leeches were applied, and afterwards the spirit lotion.

The next day the swelling was still very great; twenty leeches more were ordered, the lotion to be continued, and purgative medicine administered.

On the day following, (the 14th of January,) the swelling was very much reduced, and the nature of the injury became apparent, which appeared to be dislocation of both bones backwards, with a fracture through the external condyle, indicated by the elevation of the olecranon process of the ulna above the condyles of the humerus, and the impossibility of flexing the elbow, in consequence of the condyles of the humerus striking against the bones of the fore-arm in the attempt.

On the 15th.—The swelling being so much diminished, I made an attempt at reduction, but unsuccessfully, in consequence of the great pain it produced. Sir Astley Cooper corroborated the opinion, that there was a fracture of the external condyle, as well as dislocation of both bones backwards.

A day or two after I succeeded in reducing the dislocation, by placing the elbow on a table, and at the same time, forcibly flexing the fore-arm, while the humerus was pushed downwards and backwards.

The patient remained in the Hospital until the 30th of March, when he was discharged for ill conduct, having, however, recovered, in a great measure, useful motion of the elbow-joint.

The fracture of the external condyle of the humerus in this case complicated, in a great measure, the diagnostic marks; and, although there was an evident unnatural mobility in

the fractured external condyle, still the loss of motion of the ulna upon the humerus, indicated the separation of their articulatory surfaces. There was reason to believe, in this case, that the coronary ligament of the superior radio-ulnar articulation was not torn through, as, after the reduction, the radius performed its natural motions upon the ulna, without any tendency to displacement.

This case taught me the uselessness of attempting, while tumefaction of an injured joint is at its height, to discover exactly what is the nature of the accident, and to attempt to explain the cause of every peculiarity in the deformity; indeed physiology, rather than anatomy, should then lead the surgeon to the right diagnosis. Thus he may be satisfied, by finding immobility of the limb, that dislocation has occurred, and on the contrary, that unnatural mobility indicates fracture: in the former case, he would proceed at once to reduction, unless, as in this case, it was complicated with further accident; and in the latter, he should place the limb in the best possible position to diminish the action of the muscle upon the fractured extremity of the bones, and by constitutional means, to diminish the tendency to concomitant inflammatory action.

CASE.

In 1830, I was consulted by Miss F. in the Blackfriars Road, who had three months before injured her elbow-joint, in consequence of being thrown from a horse. The accident had happened some distance from town, where she remained under the care of a medical gentleman, with the assurance of a perfect restoration of her injured limb. Upon examination of the elbow-joint, I found the nature of the accident now sufficiently obvious, as all tumefaction had entirely disappeared. The olecranon was elevated above the condyle, the joint was permanently semiflexed, a prominence filled up the bend of the elbow, the fore-arm looked preternaturally short, and was fixed between pronation and supination; all indicating the dislocation backwards of the radius and ulna. Some degree of motion had been acquired between the bones in this new situation, and from the length of time since the accident had occurred, I was doubtful in my own mind as to the propriety of attempting the reduction, and therefore recommended the

young lady to consult Sir Astley Cooper; and the next day we met in consultation. It was his opinion, that reduction should be effected, and therefore, immediately proceeded to produce coaptation of the bones in the following manner.—Standing behind the patient he grasped the hand of the affected limb, and attempted to bring it in a line parallel with the humerus, by forcibly drawing the hand towards the patient's shoulder, which he soon accomplished, and then fastened it in that position, desiring it should so remain for a week or ten days, when passive motion was to be commenced. This position, however, was too painful to be borne, and the patient loosened the bandages of her own accord, the second day after they were applied, when she left town. I saw her a few months since, and found she had but a very imperfect use of the joint, which was still considerably deformed, and presenting many of the diagnostic marks of dislocation of both bones backwards.

Dislocation of the Ulna Backwards.

It sometimes, but very rarely occurs, that the ulna is thrown backwards from the internal condyle, without a corresponding displacement of the radius. The diagnostic marks of this accident are somewhat similar to those of the dislocation of both bones backwards, namely, so far as relates to the projection of the olecranon, and the fixed state of the joint; but superadded to these symptoms, there is a peculiar direction of the fore-arm and hand inwards, in consequence of the resistance the radius offers to the longitudinal derangement of the limb. It is difficult to imagine how such an accident is to occur, and in what direction the force could be applied to produce it; it must either be inflicted upon the ulna or upon the humerus, as no fall upon the hand can lead to this injury. The reduction of this dislocation is described as being easier than when both bones are luxated; this would naturally be inferred, when we consider that the radius being still attached to the external condyle of the humerus, forms a most convenient fulcrum during the extension of the fore-arm, by forcibly producing which, at the same time pressing the olecranon upon a firm and fixed point (as a hard table), coaptation may be readily effected.

Another circumstance may, perhaps in some measure,

tend to facilitate the restoration of the ulna to its natural position, namely, the tearing through of the coronary and oblique ligaments, which would otherwise serve to fix the ulna, and prevent its easy separation from the posterior surface of the humerus. In cases of this kind, which have not been reduced, the radius seems capable of accommodating itself to the new position of the ulna, and by its pressure upon the external condyle produces a new articulatory surface, which enables it to perform some slight degree of flexion and extension, with a considerable power of rotatory motion. This is well illustrated by a preparation in the museum of St. Thomas's Hospital, which was procured by Mr. Sylvester, from the dissecting room, while I was a pupil at that institution. I should suppose, as the radius in this accident is so completely separated from the ulna, by the lesion of the coronary ligament, that after the reduction of the ulna, the radius would be very liable to be thrown either forwards or backwards upon it, in any attempt at pronation or supination of the hand. Hence, therefore, the propriety after this accident, of maintaining rest of the elbow-joint for the longest possible period, without endangering anchylosis, so that the ligaments may have time to be fully repaired.

Dislocations of the Superior Radio-Ulnar Articulation.

The radius may be thrown either upon the fore or back part of the ulna, and these displacements have usually been described as accidents to the elbow-joint; but both anatomy and physiology, in my opinion, point out the propriety of considering such accidents, as exclusively belonging to the functions performed by the radius and ulna together, and not in reference to their motions upon the humerus. When the radius is displaced, it cannot, I believe, ever be thrown upon the fore, or back part of the humerus, but must necessarilly rest upon the ulna; this may be proved in a great measure, by producing the accident on the dead body, when it will be found, that it is by the inordinate performance of

the motion of pronation, that the radius is thrown behind the ulna, while an equally violent propulsion of the fore-arm in the direction of supination, forces the head of the radius forwards. Under either of these accidents, the motions of the elbow-joint are but slightly interfered with, although the radio-ulnar articulations are entirely fixed, and the possibility consequently of pronation and supination precluded. In the living subject, the inflammation of the synovial membrane, which is common to both the superior radio-ulnar articulation, and the elbow-joint, would necessarily disturb the natural motions of the latter; but this is not to be attributed to the displacement of the articulatory surfaces entering into the formation of the elbow-joint. Further, it may be seen in a healthy limb, that during the performance of a perfect state of extension, the radius is completely separated from the external condyle of the humerus, and pressed firmly into the sigmoid cavity of the ulna, at which time it is that excessively violent pronation or supination, would produce the accidents to which I have alluded.

Sir Astley Cooper describes several such cases to have occurred to him in his practice; and, in the account he gives of them, there seems to have been great difficulty in producing coaptation, which, I believe, principally depended upon the manner in which the reduction was attempted, as he mentions, that extension was made from the hand, with a view of acting on the radius only. This, in my opinion, is not the means by which the head of the radius is best returned into its natural situation, but that it is the action of supination and pronation, at the same time that pressure is made immediately upon the dislocated head of the radius, by which the luxation may be reduced; this is in some measure proved by the fact, that an inordinate and violent degree of supination, is the usual cause of the dislocation forwards upon the ulna, while an equally violent effort of pronation, throws the head of the radius backwards without being complicated with some other accident. The following cases are illustrative of the above principles.

CASE.

James Brown, aged 40, a stout, muscular blacksmith, was admitted into Guy's Hospital, in May, 1833, having fallen down a flight of brick steps, pitching upon his right elbow. The accident had happened about an hour previous to his admission. Upon examination, the limb was found flexed, and could only be extended with considerable difficulty, while the hand was in a fixed state of moderate supination. On tracing the line of the radius in the front of the arm, instead of its leading the eye to the external condyle of the humerus, it guided the attention to a prominence placed on the fore part of the centre of the elbow-joint, in the situation of the coronoid process of the ulna.

On viewing the posterior region of the elbow-joint, the olecranon was found in its relative position with respect to the external condyle, while on the inner side a projection was seen, which upon minute inspection, was found to be a portion of the internal condyle of the humerus, separated from the shaft of the bone, and drawn upwards by the action of the triceps muscle; the case was therefore made out to be dislocation of the radius forwards, and fracture of the internal condyle of the humerus. An attempt was then made to return the head of the radius into its natural situation, which was at last accomplished, by forcibly proning the hand, the elbow being semiflexed, while an assistant was pressing the head of the radius backwards, and outwards into the less sigmoid cavity of the ulna. The internal condyle was then brought into its proper position, and the displaced bones retained there by means of a screw splint, with a compress applied immediately over the head of the radius. Considerable tumefaction occurred after the reduction, requiring the application of leeches, and cold lotions to subdue it; and then a large pasteboard splint was applied wet, upon the fore and back part of arm, with a roller firmly bound over it. In a month the splints were removed, passive motion employed, and the patient recovered the perfect use of the elbow-joint, and superior radio-ulnar articulation.

CASE.

Mary Powell, aged 56, was admitted into Guy's Hospital in October, 1828, in consequence of an injury she had sustained from falling down stairs upon her elbow. Upon examination, the fore-arm presented considerable distortion; a distinct depression was seen immediately below the external condyle, and a hard tumour was obvious in front of the ulna and opposite to its coronoid process. Upon rotating the hand, there was no motion of the tumour to be perceived, from which circumstance some doubt arose as to whether or not the projection was formed

by the head of the radius; but upon more minute examination, a fracture of the radius was also discovered about an inch and a half below its head, which accounted for the whole of the radius not obeying the same motion. By the application of a very slight force, immediately upon the dislocated head of the radius, it was readily pushed back into its place, pourtraying the perfect laceration of the coronary ligament. The arm was then kept in a state between pronation and supination; splints were applied in the usual manner for fractures of the fore-arm, excepting that a compress was particularly placed upon the head of the radius to retain it in its natural position, which proved not difficult to be accomplished. At the end of a month the splints were removed, passive motion commenced, and the patient left the Hospital in six weeks.

The only case of dislocation of the radius backwards, which I have seen, was complicated with further injury to the elbow-joint, and had occurred fifteen weeks before.

CASE.

John Beck, aged 25, was admitted into Guy's Hospital in January 1833, with an injury to the elbow-joint, which had happened fifteen weeks before, from the kick of a horse. He stated that the limb was first put up by a surgeon in the bent, and afterwards in the straight position; but at the end of thirteen weeks, finding that he had not regained either the strength or motion of his arm, he applied for assistance at Guy's Hospital.

Upon examination of the injury, I discovered that there had been a fracture of the ulna through the coronoid process, entirely separating its upper extremity from the shaft of the bone, which was drawn forwards by the action of the brachialis internus, forming such adhesions with the fore part of the humerus as to produce a kind of supplementary articulation, while the upper fractured portion was drawn backwards by the action of the triceps muscle. The radius was separated from the ulna, and thrown outwards and backwards as if influenced by the action of the supinator radii brevis muscle. No means were employed for the reparation of this joint, but the patient was desired to make constant use of the limb, from which he derived considerable benefit, although the hand had yet a tendeney to fixed pronation.

The length of time since this accident had happened, and fracture being concomitant with a dislocation, precluded the possibility of any means being employed for restoration of the limb.

Mr. Fernandez was kind enough to describe to me the appearance of a dislocation of the radius backwards which had occurred to one of his patients. The most prominent feature in this case was the head of the radius being distinctly obvious below, and to the inner side of the external condyle. The reduction was performed by making extension from the fore-arm, while the elbow-joint was flexed, at the same time supining the hand.

Sir Astley Cooper mentions, that he had never seen this accident in the living person, but alludes to a post mortem examination of this dislocation, which had never been reduced.

The dislocations to which the inferior radio-ulnar articulation is liable, have been described by Boyer, as similar to those of the superior articulation, and resulting generally from the same cause; namely, the inordinate and violent degree of motion in pronation and supination, from which he says, "the inferior extremity of the ulna may be dislocated, either backwards or forwards upon the radius." Such an accident, however, I have never seen. An accident to which the inferior extremities of the bones of the fore-arm are liable, has lately been noticed by Sir Astley Cooper, and written on by a French surgeon of considerable eminence, in one of the Paris Journals, is a fracture through the lower extremity of the radius, in the situation of the epiphysis in the adult and through the epiphysis at earlier periods of life. The principal deformity is the projection of the inferior extremity of the ulna inwards and backwards, so as to lead to the belief that the ulna is the displaced bone; while on the contrary, I believe, that it is the radius which is thrown out of its natural situation, as the physiology of this joint would lead us to suppose; it being the radius which turns upon the ulna, the latter bone being perfectly fixed. Upon further examination of this accident, a crepitus may generally be discovered by moving the lower extremity of the radius, and on tracing the various extensor tendons to their insertions, they will be found to deviate from their natural course and relative position with respect to each other.

About six weeks since, I was thrown from my gig and severely injured my wrist-joint. Sir Astley Cooper, who was kind enough to call upon me, examined my arm, and pronounced it immediately to be the accident which I have described. I could not readily believe that I had sustained so severe an injury, neither could I feel any crepitus by the most minute examination of the extremity of the radius, but the apparent displacement of the ulna, and irregularity in the direction of the extensor tendons, were certainly evident; and besides, the thickening of the bone, which has occurred in the process of reparation, induces me to believe that I have been the subject of this accident. The cause of the accident is usually the forcible propulsion of the hand backwards; and our demonstrator, my friend Mr. Edward Cock, in whose judgment I have the greatest confidence, and for whom I cannot deny myself this opportunity of expressing my esteem, tells me, that this accident may be always produced upon the dead body by forcing the hand backwards, and that the diagnostic marks present themselves immediately as in the living subject, although, perhaps, not quite so prominently. Several such cases have lately applied at our surgery, but as none of them remained, I cannot detail precisely the circumstances under which the accidents were produced, or the progress of their recovery; but rest of the wrist-joint, by means of splints, with a compress under the palmar splint to press the inferior extremity of the radius backwards, seems to be the readiest means of effecting their cure.

Dislocations of the Radio-Carpal Articulations.

As in the motions of the wrist-joint the radius and the ulna remain stationary, while it is the scaphoid, lunar, and cuneiform bones of the cubital row of the carpus, which, by their mobility, produce the action of flexion and extension, these dislocations should be described as displacements of the carpus, and not of the inferior extremities of the radius and ulna.

The luxation of the convex surfaces of the three first bones of the carpus, from the inferior surface of the radius and inter-articular cartilage, may take place in four directions, —backwards, forwards, outwards and inwards.

The dislocation backwards is the most frequent; in which accident the carpus is driven behind the radius usually from a fall upon the back of the hand, while, in a state of flexion; the force being thus applied to the inferior extremities of the metacarpal bones, which, from their length and firm attachment to the carpus, tilt them over the posterior surface of the radius; a shortening of the palmar surface, and a permanent flexion of the hand is immediately produced, and the kind of deformity readily leads to a knowledge of the nature of the accident. I have never seen this accident completely in the direction backwards; but a few weeks ago a man was admitted into Accident Ward, Guy's Hospital, in whom the displacement had occurred outwards as well as backwards, rendering the deformity greater, but equally characteristic of its nature. This dislocation was very readily reduced, indicating the extent of laceration of the ligaments of the joint; the process of reparation was slow, but he ultimately recovered the use of his hand.

Dislocation of the Carpus Forwards.

This accident is of rarer occurrence than that last described, but it seems that it might arise from a fall on the palm of the hand during its extension; from which accident the inferior extremity of the metacarpal bones receives the impulse of the fall, and directs the carpus forwards upon the inferior extremity of the radius. The diagnosis of this injury is the permanent extension of the hand, and the hard projection formed by the convex articulatory surface of the three upper bones of the carpus. If this dislocation be complete, it would indicate a degree of force to have produced the injury, as would lead to a very unfavourable prognosis. The result of the application of the force capable of producing this accident, more frequently leads to a fracture of the lower part

of the radius, and displacement of the inferior radio-ulnar articulation.

Sir Astley Cooper has described two cases of the dislocation of the carpus backwards, but in both of them the luxation was compound, and the radius fractured, nor does he describe dislocations of the radio-carpal articulation without fracture. The deformity, however, would be inevitably so great that there would be no difficulty in understanding the nature of the injury.

In the lateral dislocations of the carpus from the radius the displacement can never be complete, unless, indeed, there be such extensive laceration of soft parts, as to leave no hope excepting from amputation. A projection of the carpus, either beyond the styloid process of the radius or of the ulna, points out the outer or inner partial dislocation of the wrist-joint, the degree of injury to the soft parts being proportionate to the extent of displacement of the bones. In all the dislocations of the radio-carpal articulation the reduction is easy, in proportion to the shortness of the period since the accident; therefore, no time should be lost in attempting the reduction, so as to prevent the muscles from gaining a permanent contraction.

Dislocations of the Carpus.

The peculiar function which these bones perform, and their figures, render them but little liable to displacement from each other. So rare, indeed, is the accident, that in most books on surgery this subject does not form a section of the work. Boyer, however, mentions the case of a lady, who, during her protracted and painful parturition, squeezed so violently the edge of the mattress, as to produce a luxation of the os magnum, from the cavity formed by the scaphoid and semi-lunar bones. Chopart has also observed a similar accident; and I have myself seen a dislocated os magnum, without any other injury. Gun-shot wounds and the bursting of fowling pieces, not unfrequently produce the separation of the carpal bones from each other, but usually at the same time such

comminution of bone and laceration of the soft parts as to render the removal of the hand necessary; or if there be a hope of saving this important organ, still the coaptation of the displaced bones, whether fractured or dislocated, leads to very different views from the treatment of simple luxations.

CASE.

Daniel Woodhill, a young stout and muscular policeman, came to the Hospital in December, 1830, in consequence of an injury his wrist had sustained from a fall on the hand, which was flexed under him to such a degree as brought the palmar surface of his fingers in contact with the fore-arm. Upon examining the hand (the part where he complained of most pain), a round and hard tumour, rather larger than a marble, produced a most evident deformity on the dorsal surface of the wrist, opposite to and above the base of the metacarpal bone of the middle finger. The hand was slightly flexed, and extension gave considerable pain; the tendon of the extensor carpi radialis brevior muscle was thrown slightly out of its course, and rather nearer than natural to the radial side of the hand: the fore-finger was abducted from the middle one, and any attempt to approximate them gave great pain at the bases of their metacarpal bones; and opposite to the base of the middle one there was a depression quite evident, both to the sight and touch. Reduction was attempted by extending the whole hand, at the same time making pressure upon the displaced bone; this not succeeding, extension was made from the middle and fore-fingers only, while pressure was kept up on the magnum, which suddenly slipped into its natural situation without any difficulty; the tumour disappeared, the depression below it was filled up, and the middle and fore-fingers were approximated: in short, the whole hand regained its natural shape; on flexing which, however, the dislocation immediately recurred, and the whole deformity returned; the bone was again reduced, as before described, and to maintain the coaptation, a splint was placed on the palmar surface of the fore-arm and hand, while a compress was applied on the dorsal surface of the wrist immediately upon the os magnum, and the bandage which confined the whole apparatus was kept wet with evaporating lotion. The man was anxious to go home, but again presented himself at the Hospital in two days, when it was found, that the bone had been retained in its place; notwithstanding that in consequence of some swelling which had occurred, he had loosened the bandage. On removing the splint, and performing the slightest flexion of the hand, the os magnum again became dislocated, and was again put up as before. He was in the habit, for ten days after, of

frequently coming to Guy's, and showing this dislocation to the pupils, and it was always easily reduced, often by pressure only. I described to him the necessity of his allowing the bone to remain for a length of time in its natural situation, if he wished to recover the permanent use of his hand, and that, therefore, he should by no means submit to its repeated displacement. On the following day, this man was committed to prison, and has not been since heard of.

Dislocations of the Metacarpus from the Carpus.

The metacarpal bones are so firmly connected with the carpus and with each other that their luxation can scarcely occur, unless a concentrated force be applied, so immediately upon one of them as to tear through its ligaments; but even then, the bone is much more liable to fracture than dislocation. I have, however, referred, in the case of Foskitt, page 118, to the dislocation of two of the metacarpal bones from the carpus, which had been produced by a large garden roller; producing, at the same time, fracture of the other metacarpal bones, and such laceration of soft parts as to render amputation at the wrist necessary. From the scarcity of these cases I have nothing to offer, either in the diagnostic marks or treatment of the dislocations of the metacarpus from the carpus, but should conceive that the deformity produced by the displaced bones would readily lead to a knowledge of the nature of the accident, although the formation of the articulations and motions of the metacarpal bones upon the carpus, as well as their connexion with each other, render the consideration of their accidents, not only referable to one bone, but, as in the accidents to which the carpus is liable, referable to the whole.

Surgeons have described the dislocation of the metacarpal bone of the thumb from the os trapezium; but, I should say, improperly, as the physiologist must at once see, that there is no resemblance between the first bone of the thumb to the metacarpal bones of the fingers; on the contrary, it forms a very moveable articulation with the carpus; it is unconnected with the metacarpal bones, it has four distinct muscles inserted into it, and its functions, as well as its accidents, must

be considered independently; while, on the contrary, as I have said of the metacarpus, they must be viewed collectively. I have seen the first phalanx of the thumb thrown forwards and inwards upon the os trapezium, producing its fixed extension, and the impossibility of bringing it parallel with the fore-finger. Upon one occasion, when there was considerable difficulty in restoring the bone to its situation, a piece of tape, with the clove-hitch, was fixed upon the middle phalanx, and by steadily maintaining extension for ten minutes, at the same time drawing the thumb inwards, and towards the palmar surface of the hand, the dislocation was reduced.

Sir Astley Cooper has described two cases of dislocation of the first phalanx of the thumb from the os trapezium; in one, the accident had occurred from the application of so great a force, as to render amputation of the whole thumb necessary; in the second case, the accident occurred to a young gentleman, thirteen years of age, from the explosion of gunpowder; and although the luxation was attended with very severe injury to the soft parts, still, as the long flexor muscle to the thumb was left uninjured, Mr. George Cooper, of Brentford, by judicious treatment, saved this important organ. I mention this case, rather with a view to point out the propriety of doing every thing that can be done to save the thumb, which, in fact, may be considered nearly as forming one half of the useful mechanism of the hand.

CASE.

Thomas Hoskins, aged 7 years, in June last applied at the surgery at Guy's Hospital, in consequence of a fall, in which he had severely injured his thumb, upon which he had fallen while it was in the extended position. Upon examination, it was found that the second phalanx had its superior extremity thrown in front of the first, producing its fixed extension, and indicating at once, from its appearance, the nature of the accident. A piece of tape was fixed upon the dislocated phalanx, by means of the clove-hitch, by which extension being made, and at the same time pressing upon the base of the bone, it was with some difficulty drawn into its place.

CASE.

Thomas Gardiner, aged 25, while fighting, injured his thumb so seriously that he applied for relief in May, 1833, at Guy's Hospital. Upon examination, it was found that he had dislocated the second from the first phalanx, its superior extremity being thrown upon the dorsal surface of the first; the distortion rendered the nature of the accident very obvious, the second phalanx being fixed in the flexed position, and its base easily felt projecting upon the posterior part of the first; by the same means, namely, the clove-hitch, this luxation was also reduced, and with somewhat less difficulty than the last mentioned, taking into consideration the age of the patient. This may be explained by the direction of the dislocated bone, which in this case led to the fixed flexion of the joint, and thus removed the great opposing force of its flexor muscle, the power of which preponderates beyond its extensor.

CASE.

In June, 1833, a gentleman called at my house to consult me, who, the evening before, had been thrown down from placing his foot upon a piece of orange peel; he fell to the ground with great violence, and immediately upon the inferior part of his right thumb, which forced the superior extremity of the last phalanx upon the dorsal surface of the second; the extreme phalanx was permanently extended, deviating from the position of the first or second, when either of them are dislocated in that direction, in consequence of the shortness of this bone, when dislocated, not admitting of its being acted upon by the flexor tendon. The great deformity was produced by the inferior extremity of the the second phalanx, which formed a very considerable projection upon the palmar surface of the thumb, while a deep cleft was observed on the corresponding dorsal surface. I fixed a piece of broad tape by the clove-hitch on the luxated bone, and assisted by my apprentice, Mr. J. H. Roberts, we made extension for about three minutes, when it slipped into its place. I must confess I was surprised at the facility with which the reduction was effected, considering the smallness of the bone dislocated, the difficulty of the application of an extending force, and the powerful muscles in opposition.

CASE.

Patrick Sweeney, aged 51, came to Guy's Hospital in February last, in consequence of an injury he had sustained to the thumb of the right hand, occasioned by the fall of a large stone upon the dorsal surface of the last phalanx.

Upon examination, it was found to be a compound dislocation, the base or superior extremity being thrown forwards upon the palmar surface of the second phalanx; it was immediately reduced by making extension, at the same time, pressing forcibly upon the base of the dislocated bone. The facility of its reduction depended upon the extensive laceration of the ligaments; splints were placed upon the thumb, saline purgatives administered, and the patient was desired to keep his hand in a perfect state of rest. On the following day he complained of little or no pain, and every thing appeared to be going on well; but three days after, an erysipelatous blush spread on the hand, which it was in vain to attempt to check, and it extended up the arm, causing so much constitutional irritation as to render it necessary to take the man into the Hospital. As all the usual means still failed in checking the progress of this disease, it clearly indicated the necessity of doing every thing most likely to alleviate the local cause of these urgent symptoms. The splints were therefore removed from the thumb and a large poultice applied; the benefit of this treatment became immediately obvious, and after poulticing for a short time, the last phalanx sloughed away, and the inferior extremity of the second exfoliated: the wound ultimately granulated, and the patient left the Hospital in about a month quite well.

The phalanges of the fingers are in the same manner liable to dislocation as those of the thumb; the diagnostic marks, and the treatment are precisely similar. Within a very short time, we have had four persons apply at Guy's Hospital the subjects of this accident; two were dislocations of the extreme phalanx backwards, one of the fore-finger, and the other of the middle, they were readily reduced by means of the clove-hitch. About a month since, I saw a compound dislocation of the extreme phalanx of the middle finger forwards, occasioned by the attempt to catch a rapidly thrown cricket ball; the displaced bone was readily reduced by making extension, and the young gentleman suffered little or no inconvenience from the accident. If with dislocation of this phalanx, there be at the same time fracture, I believe it is better to remove the bone, than to call upon nature to attempt to repair so complicated an injury.

Dislocations of the Joints of the Lower Extremity.

The bones of the lower extremity are liable to displacement, but not so frequently as those of the upper, in consequence of the function they have to perform rendering them necessarily much more firmly articulated; and forming also, as they do, the basis of support, and being the organs of locomotion, they present much larger articulatory surfaces than the more moveable and lighter bones of the arm.

Dislocations of the Hip-Joint.

Like all other enarthrodial-joints, the head of the femur may be thrown from its deep cotyloid cavity, in any direction radiating from its centre; but immediately that it is so displaced, the thigh-bone becomes influenced by some of its powerful muscles, and therefore, authors have described four directions in which the luxated head of the bone is permanently fixed.

The first and most frequent, is the dislocation upwards and backwards upon the dorsum ilii; next in frequency, is the dislocation downwards into the foramen ovale; then, the luxation backwards and upwards into the ischiatic notch; and the last and rarest direction for the displacement of the head of the femur, is forwards, upwards, and inwards, upon the os pubis.

It is quite essential that every surgeon should possess the most correct view of the diagnostic marks which point out the difference of these luxations, and which can only be acquired by a thorough knowledge of the muscles of the joint; when thus prepared, he readily understands the best means of applying the extending force to overcome his antagonists, the irritated muscles. It is from this knowledge we so often see the comparatively slight force of a scientific surgeon perform a feat, which the porter-like qualifications of the ignorant fail in effecting. I repeat these preliminary remarks, because it is in dislocations of the hip-joint, of all others, that the surgeon will require science as well as art to effect the reduction.

Dislocation on the Dorsum Ilii.

It usually happens, that the person who is the subject of this injury, was at the time of its infliction, either carrying a heavy weight upon his back when he fell, or that in a stooping position a heavy weight had fallen upon him; either of which causes having a tendency to drive the pelvis below the head of the thigh-bone, it is consequently forced upwards upon the ilium. It is, I believe, the frequency of the application of such force which renders the joint more liable to dislocation in this direction, than any other, and not any peculiarity in its formation.

The most prominent characteristics of this dislocation are as follow:—The great degree of shortening of the limb; its rotation inwards, to an extent that brings the trochanter major much nearer to the anterior and superior spinous process of the ilium; the foot on the injured side resting upon the tarsus of the opposite, while the knee is slightly flexed and in advance of the other: nor can any of these signs be removed without the application of a force sufficient to reduce the dislocation. On further examination, the natural roundness of the affected hip will be found to be lost, in consequence of the relaxation of the glutei muscles; and the skin in the inguinal region has a peculiar tense or tightened appearance, caused by the psoas and iliacus muscles being put upon the stretch, in proportion to the extent of the luxation. In this, as well as in all the dislocations of the femur from the cotyloid cavity, the capsular ligament and the ligamentum teres are necessarily torn through. The displacement is sometimes the effect of disease, and produces diagnostic marks very similar to those just described; but under such circumstances the history of the case, rather than the presence of these external signs, indicate both the treatment and prognosis, as well as the cause of the complaint. It appears to me scarcely necessary to mention the distinguishing marks, between the dislocation of the femur upon the dorsum of the ilium, and fracture of the neck of the thigh-

bone; but as all surgeons seem to have taken this precaution, I will just mention, that it may always be known from fracture of the cervix femoris, from the fixed position of the joint, while in fracture, its mobility will preclude the possibility of confounding the two cases; indeed, the only one circumstance in which they at all resemble each other is the shortening of the affected limb, while the inversion in the dislocation, and the eversion of the foot in fracture, forms a further infallible distinction. If the patient, the subject of dislocation, attempts to walk, the foot, as it is advanced, can only be brought to the ground upon the inner side of the great toe, while the heel remains elevated and directed outwards, so that the patient is incapable of bearing any weight upon the limb, and each attempt at progression produces considerable pain.

Having ascertained that the patient is the subject of a dislocation upon the dorsum of the ilium,—that the displacement has occurred from the application of some violent force, and not from disease,—as well as that no morbid change has rendered it unfit to attempt the reduction of the dislocated bone, the surgeon will begin at once to adopt the following plan for the coaptation of the luxated limb; which object can only be gained by the judicious application of such remedies as have a tendency to diminish the vital power, and by the employment of mechanical means the best adapted to take advantage of the muscular depression thus produced. When the patient is reduced to a state of approaching syncope, by the means which have been employed (severe in proportion to the power of the individual), he should be laid on his back, wrapt up in blankets, upon a table of convenient height, placed between two staples, a strong leathern padded girth, with an opening in it sufficiently large to admit the injured extremity, is to be so adjusted as to press upon the perineum on one side, and to embrace the crista of the ilium as its other point of bearing, when its two extremities are to be fixed to one of the staples, so that it forms a line continuous posteriorly with the direction of

the dislocated thigh. This part of the apparatus is for the purpose of firmly fixing the pelvis, and forming what is termed the counter-extending force; a wetted cloth or linen roller is then to be tightly applied above the knee, and upon this, a circular leathern strap is to be buckled, being furnished with two strong iron rings, suspended at right angles with the circular part by two leathern straps, the leg being slightly flexed upon the thigh, so as to prevent the slipping of the apparatus; to these rings the hook of the pulleys is fixed, while the other extremity is attached to the staple opposite to that of the counter-extending force, and thus the extending power is arranged. The surgeon should now draw upon the string of the pulleys, so as to tighten the whole apparatus, and the patient should be so placed, that by bringing the knee of the injured limb slightly across the other, the direction of the extending and counter-extending forces together form a straight line in the direction of the long axis of the dislocated limb, and bisecting the horizontal position of the body at an angle of about thirty degrees, the extension should be continued by drawing upon the pulleys, so as to tighten, even to stretching, every part of the apparatus, gradually continuing it to the extent which may be thought adviseable, and maintaining it until the muscles yield,—a period which is indicated by motion of the dislocated bone. When the surgeon finds that the head of the bone approaches the acetabulum, he should give up the pulleys to an assistant, and himself attempt to direct it into its proper place, either by the raising or by rotating of the limb. The return of the head of the bone is not generally indicated by a snap, so that it is difficult to be certain of the reduction being complete without removing the apparatus: a step, however, which should always be avoided, until the surgeon's mind is convinced of their not being again required, for nothing is so dreadful to the patient as the necessity for their fresh adjustment. As a snap is not to be expected, when the head of the bone returns into the acetabulum, the only means a

surgeon has of judging of this desired event without loosening the apparatus is, by ascertaining whether or not the trochanter-major has resumed its natural distance and direction, with the anterior and superior spinous process of the ilium. When the surgeon has reason to believe that the bone is in its proper place, the extension on the pulleys may be diminished, watching at the same time, whether or not the head of the femur is resuming its unnatural position, which it will do, if the reduction is not perfected, and cannot, if it be buried in the acetabulum. The whole apparatus may then be removed, and the patient placed in bed, little or no means being required to prevent the recurrence of the accident, beyond bringing the thighs together by means of a bandage. If the force which has been employed for the reduction of the dislocation has been very great, it may be necessary to apply leeches, or, perhaps, even constitutional remedies may be required to overcome the subsequent inflammation; the patient should be kept in bed for at least a fortnight after the accident, before he be allowed to use the limb, and then only, should passive motion be first employed, so that the different structures of the joint may have time for their reparation.

CASE.

John Day, a strong and healthy Irish labourer, 28 years of age, while walking along a plank with a basket of sand upon his head, fell several feet into an empty barge, when upon attempting to rise he found himself incapable of doing so, suffering considerable pain in the left thigh in the attempt. About four hours after the accident he was brought into Guy's Hospital, where I immediately saw him, and drew the attention of the pupils to the following diagnostic marks of dislocation of the femur upon the dorsum of the ilium. In the sitting posture the right knee was inclined inwards towards that on the opposite side, the thigh was flexed upon the pelvis, and the whole limb inverted. When standing, the trochanter-major could be plainly felt behind, and a little above its natural situation; the whole limb appeared much shortened, and upon measurement, proved to be an inch and a half shorter than the other; the point of the great toe of the injured side rested upon the instep of the opposite foot; the thigh admitted of

flexion to a great degree, but neither rotation, adduction, or abduction could be produced. From the degree of shortening of the limb, as well as from the perfect impossibility of producing rotation outwards, in consequence of the head of the femur striking upon the ilium, I was at once led to pronounce it a dislocation upon the dorsum, and not as some believed, into the ischiatic notch.—The following means were then employed for its reduction.

Twenty-six ounces of blood were drawn from a large orifice; he was then made to smoke a pipe (to which he had not been accustomed). These means brought on a state approaching to syncope, in which he was carried into the Operating Theatre; here he was placed upon the table on his back, between two points, where the extending and counter-extending forces were fixed. The counter-extension was made by means of the padded girth, with the opening for the injured limb; this being passed between the thighs and over the crista of the ilium was fastened to a cord, which made, with the axis of the body, an angle of about thirty degrees. The extension was produced by means of pulleys, attached to a jack-towel, fastened round the thigh over a wetted bandage. Half a grain of tartarized antimony was given, and the dose repeated in about ten minutes. The cords were gradually tightened for a quarter of an hour, when, notwithstanding that the knee was flexed, the towel had a tendency to slip; I therefore requested, for the purpose of assisting by the application of a new force, that my dresser should stand upon the table, and by means of a cloth passed under the patient's thigh and over his own shoulders, attempt to raise the dislocated femur, while I directed the head of the bone into the acetabulum. While this attempt was making, the towel slipped completely over the knee, apparently rendering all our attempts abortive, and at the same time the necessity for the re-adjustment of the apparatus. Before, however, they were again applied, I took the opportunity of examining whether the limb had undergone any change from the extension which had been made, and was surprised to find, upon every investigation that I could make in the recumbent posture, that the limb had regained its natural situation. I immediately directed the patient to stand up, upon which he at once expressed his conviction that the bone was replaced, as he had the power to bear weight upon the limb, which was now of an equal length with the other, and was capable of motion in every direction, losing therefore, all the signs of dislocation. It was my opinion, that the reduction had occurred upon the first application of the apparatus; for, at that moment, it was observed, that the trochanter was influenced by the extending force; that noise should not indicate the coaptation of the bones, can hardly be a circumstance for surprise, when we consider that the muscles were so stretched by the mechanical means employed,

as to destroy their natural contractile power, without which, no collision of articulatory surface could happen. The patient was immediately ordered to bed, and to have the limbs confined to each other by a bandage above the knees, more for the purpose of preserving the hip-joint in a perfect state of rest, than from any view of preventing the recurrence of displacement.

On the following morning he was able to move the limb in all its natural directions, although not without complaining of pain and stiffness; twelve leeches were therefore ordered to be applied over the hip-joint, from which he obtained almost immediate relief. From that period to the 29th of June, occupying a space of three weeks, he required no more medical care than attention to the extent he used his limb; and when he left the Hospital, not a month after the reduction of his dislocation, he was enabled to walk perfectly well.

There are no remarks necessary upon this case beyond what has already been described, as generally appertaining to such accidents; the diagnostic marks of the injury and the means employed for its reparation, being all perfectly congruous with the principles usually laid down.

I have seen, perhaps, four or five dislocations upon the dorsum of the ilium, at the Hospital, and in private practice, in the last twelve years; and have heard of several others, which have occurred at the Hospital within that period, under the care of my colleagues, in all of which the similarity of the diagnostic marks, and the successful result of the application of the constitutional and mechanical means described, tend to prove the legitimacy of the principles now adopted for the treatment of this dislocation.

The length of time, subsequent to the accident, at which reduction may he attempted, requires, perhaps, more sound surgical judgment, than any point connected with this injury; particularly when we consider that those changes, which would render the return of the bone into its natural situation improper, occur at different periods in different individuals; it is then that the physiologist and the anatomist will stand pre-eminent over him, whose knowledge, although founded upon long practical experience, has never been grafted with the first principles of his profession. Sir Astley Cooper, in his Treatise on Dislocations, (pp. 42 and 48, Fifth Edition,)

describes the reduction of these dislocations, nearly a month after they had occurred. This may not appear, at first thought, to be a matter of much surprise, when many cases are on record of dislocations of other joints, where the reduction has been effected at much later periods; but it should be remembered, that little or no analogy can be held in the restorative powers of the different articulations; and that in the hip-joint, the great weight it has to support, the numerous and strong muscles, under the influence of which it is governed, as well as the constant necessity for locomotion, all render the early reduction of dislocation of this joint essential, as nature, invariably, quickly commences a process to establish a supplementary articulation in the new position of the bone, when it becomes improper to attempt reduction.

A case is related, quoted from the Medico-Chirurgical Society, under the care of Mr. Tripe, of Plymouth, in which a dislocation upon the dorsum of the ilium had been reduced seven weeks after the infliction of the injury; but others, at much shorter periods are quoted, where all attempts at reduction were unavailing; therefore, it still remains for the surgeon's mind to be governed, not by any general rules, but to be influenced by the circumstances of each individual case; such as the degree of mobility of the bone in its new situation, and the altered state of the cotyloid cavity, which soon undergoes changes as to render it unfit again to receive the head of the femur.

Dislocation of the Head of the Femur Downwards and Inwards into the Foramen Ovale.

This dislocation occurs nearly as frequently as that upon the dorsum of the ilium, the tendency principally happening from the great extent of motion which the thigh-bone enjoys in abduction, the inordinate performance of which is the most frequent cause of this luxation. The mode by which the head of the femur is forced from the acetabulum into the foramen ovale, may be best comprehended, by considering

its position in the act of a most violent "lounge" in fencing, by which position the os femoris is forced against the inner and lower part of the capsular ligament, when the whole weight of the trunk being thrown forwards at the same moment, the impetus and weight of the body, together, rupture the capsular ligament and ligamentum teres, and thus produce the accident in question.

The diagnostic marks of this kind of luxation are so obvious, as to render it very easy of detection; and the sign of all others, which, with common attention, precludes the possibility of mistake, is the inormal lengthening of the affected limb; but besides this, the wide separation of the thighs from each other, the fixed advance of the dislocated extremity, its slight permanent rotation outwards, the unnatural flatness of the inguinal region, and the tightened cord-like tension of the muscles situated on the inner side of the thigh, as the adductors and pectineus, all present too striking a feature to admit of a doubt: and further, in very thin people, the head of the bone may be felt in its new situation. If the patient attempt to stand, the trunk will be found to be bent forwards upon the pelvis, from the degree of stretching of the psoas and iliacus muscles; and Boyer has happily enough likened the attempt at progression of the subject of this accident, to that of a mower.

The mode of reduction is regulated under precisely the same principles, as those which regulate the coaptation of other dislocated bones, excepting that the extending and counter-extending powers are employed in a different direction to that used in the other dislocations of the hip-joint; and although a surgeon might detect at once the nature of the injury which his patient had sustained, still he would be perfectly incapable of relieving him, or, at least, not without doing him a severe injury, unless he completely understood the best mode of applying the necessary force, which may be effected in the following manner.

Having first prepared your patient by subduing his nervous influence over the muscles, he should be placed upon the

table upon his back, when the extending force is to be applied, by passing a girth around the upper part of the affected thigh, so high, indeed, as to be in contact with the perineum: the end of this strap is to be fixed to the hook of the pulleys, which are attached to the staple on the injured side of the patient, while the counter-extending force or apparatus, for the purpose of fixing the pelvis, is composed of a girth, which is completely to surround both the ilia; at the same time, being admitted through the noose, formed by the girth attached to the dislocated limb, and then being attached to the opposite staple, the two girths, during the application of the extending power, are made to fix each other. The surgeon should now, the apparatus being properly adjusted, begin to make gradual extension upon the pulleys, until the head of the femur can be felt moving from the foramen ovale, when he may either make fast the pulley-rope, or give it into the hand of an assistant; he is then to place himself by the ankle of the sound limb, and by passing his arm behind it, is to grasp the ankle of the dislocated extremity; when drawing it towards the middle line of the long axis of the patient's body, he acts upon the head of the dislocated femur, with the most powerful lever of the first order, and under common circumstances readily reduces the dislocation. If the surgeon were to pass his arm in front of the sound limb instead of behind it, he would not so readily effect the reduction, as he would then produce a tendency to the depression of the head of the femur, while, by the contrary mode he elevates the bone. This observation I first heard made, and indeed, saw practised by my colleague, Mr. Key, in a case which occurred at Guy's Hospital, in 1822, and which is quoted by Sir Astley Cooper, in his treatise on this subject. I have seen one other case of this dislocation, since I have been surgeon at Guy's Hospital, and which was reduced precisely in the manner just described.

The prognosis in this dislocation seems more favourable than when the head of the bone is thrown upon the dorsum of the ilium, as in the two cases which I have seen; and

the result of Sir Astley Cooper's experience seems to be, that the patient sooner recovers the use of the joint, and in every way sustains less injury. Should any great difficulty occur in reducing this dislocation, by the mode which has been described, it seems to me that the reduction might be facilitated, by drawing the table so far from under the patient, during the application of the extension, as to bring the buttock upon its edge; and then while the surgeon is drawing the dislocated limb towards the central line of the patient's body, an assistant is enabled, by pressing the inferior extremity of the femur downwards and backwards, to tilt the head of the bone forwards, the edge of the table acting as a fulcrum. The student should remember, in taking a retrospective view of the mode employed for adjusting the apparatus for making extension and counter-extension, that they form a continous line with each other; but which line, instead of producing an angle of 30 degrees, with the horizontal line of the patient's body, as in the luxation on the dorsum, is in this dislocation, forming very nearly a right angle with it. It is by having these principles at the fingers ends, that the one surgeon is ready in the immediate employment of the best means for the restoration of an injury; while the other stands aghast, hesitating at least, if not ignorantly inactive.

Dislocation Backwards and Upwards into the Ischiatic Notch.

Boyer, as well as many other surgeons, has fallen into the error of describing this dislocation as one downwards and backwards; a mistake which must have occurred from contemplating the pelvis, as placed before him on the table, instead of taking its proper bearing as articulated in the skeleton. In this dislocation the head of the femur is thrown upon the pyriform muscle, immediately opposite to that part of the ossa innominata, where the ilium and ischium join, and on a plane slightly above and behind the centre of the acetabulum. The diagnostic marks of this accident are

so similar to those of dislocation upon the dorsum ilii, that there is considerable difficulty in distinguishing between them; in both, the affected limb is shortened, inverted, and fixed; but Sir Astley Cooper's experience has taught us, that by strict observance to the following distinctions, a just diagnosis may be formed. By placing the patient, the subject of this accident, in the erect posture, the great toe of the affected limb is placed over the great toe of the sound one, instead of being directed as in the dislocation upon the dorsum, over the instep, indicating, that the extent of shortening is much less in this, than in the other dislocation; the knee is also less in advance, but is slightly flexed, and rotation is more permitted when the head of the bone is buried in the ischiatic notch, than when resting on the dorsum of the ilium; and no trace of the head of the femur can be perceived from the great depth at which it is buried. The force which produced this luxation, is most likely to be applied when the pelvis is bent upon the femur, or when the femur is flexed upon the pelvis, which force, by driving the knee inwards, tends to displace the head of the femur backwards and outwards, but that the glutei muscles direct it slightly upwards.

To effect the reduction of this dislocation, the same means are employed as in cases of dislocation upon the dorsum of the ilium, excepting that the patient is placed upon his sound side, instead of on his back; and the angle formed by the continuous line of the extending and counter-extending forces, with the horizontal line of the body, is much less acute, forming an angle of about 45 degrees, instead of 30.

To succeed in reducing this dislocation, is more difficult than in the displacement on the dorsum, in consequence of the depth which the head of the bone is sunk in the ischiatic notch, requiring, therefore, that a round towel should be placed around the upper part of the thigh, by means of which the surgeon or an assistant may raise the head of the bone over the posterior edge of the acetabulum.

Boyer describes that this luxation is more frequently the

result of some secondary effect, from the motions of the lower extremity after dislocation upon the dorsum of the ilium. I cannot see, how, under the limited motions of a dislocated limb, the muscles can possess sufficient power to produce so great a change of position; although, I believe, it might occur during the attempt at reduction of such a dislocation, and the changes of the relative position of the prominences of bone, lead the surgeon to believe, that he had produced natural coaptation, when, in fact, he had only lodged the head of the femur in the ischiatic notch, instead of in the acetabulum.

The only case of this dislocation, which I have seen, is the third related at p. 76 of Sir Astley Cooper's book, and which was reduced in the manner I have described; the rotation of the limb inwards, however, seeming to form the principle cause of the reduction. I must observe, that in one or two of the dislocations of the hip-joint, I have heard it a subject of discussion, whether the head of the bone was upon the dorsum of the ilium, or in the ischiatic notch. The dispute arising from the degree of shortening of the limb,—a diagnostic mark, in which there is considerable deviation, for the limb becomes shorter, as the space of time increases since the accident has occurred, so that it may vary at first from an inch, to ultimately three inches and a half in degree.

Dislocation of the Head of the Femur Upwards and Forwards upon the Pubes.

This seems, from the history given of luxations of the hip by different authors, to be of most rare occurrence; and as the diagnostic marks are so strong as to render it easy of detection, as well as the difficulty with which any force can be applied to throw the head of the bone from the acetabulum, in that direction, there remains no reason to doubt but that it is an accident to which the human frame is but little liable. Dessault mentions a dislocation of this kind, which was produced by a man in carrying a sack of flour on his back having a tendency to fall backward, while his foot was fixed

in the ground, thus tearing through the capsular ligament, and lodging the head of the bone in the fold of the groin immediately underneath Poupart's ligament. Sir Astley Cooper describes the most frequent cause of this accident in the following words:—"It happens when a person, while walking, puts his foot into some unexpected hollow, and his body, at that moment, being bent backwards, the head of the bone is thrown forwards upon the pubes." He mentions the case of a gentleman, who had met with this dislocation, by placing his foot into a hollow, while walking across a paved yard in the dark, when on attempting to extricate himself, he fell backwards, and luxation on the pubes was the consequence.

The diagnostic marks of this dislocation, which in appearance give it very much the resemblance of fracture of the neck of the thigh-bone, are as follow:—The limb is slightly shortened, and differing from every other luxation of the hip-joint, is everted; the trochanter-major is brought inwards and forwards, immediately under the anterior and superior spinous process of the ilium; and in tracing the axis of the femur, its shaft will be found to be directed backwards: but the grand distinguishing mark of all, and one readily to be discovered, is a hard tumour, formed by the head of the bone, just on the inner side of the acetabulum, between it and the linea-ilio-pectinea; this tumour obeying the motions of the whole limb. Numbness is also sometimes produced, by the pressure of the head of the bone upon the anterior crural nerve, and great pain, or even paralysis of the limb may be caused by flexion of the femur upon the pelvis. Precautions are generally given that this luxation be not mistaken for fractures of the neck of the thigh-bone, as the outward signs of both are so similar; but the unnatural fixed position of the limb in dislocation, contrasted with its inormal mobility in fracture, leaves no excuse for the surgeon who forms an incorrect judgment of either of these injuries.

CASE.

William Cracknell, aged 46, by trade a carpenter, was brought into Guy's Hospital, December 28th, 1831, in consequence of an injury he had sustained to his hip-joint under the following circumstances. He stated that he was at work upon a scaffold, elevated to the third story of a house, through which he fell, striking himself, however, several times against the scaffolding in his descent, from which circumstance, probably his life was saved. Upon attempting to rise, he found himself unable to do so, and more from an injury to his hip than from any other violence he had sustained. He was therefore immediately brought to the Hospital, when upon examination of the left hip, the following diagnostic marks presented themselves.—The injured limb was an inch shorter than the opposite, and permanently everted; the head of the thigh-bone could be distictly felt, just upon the inner side of the acetabulum and obedient to the motions of the limb; attempts at motion, in any direction, gave great pain, attended with a sensation of numbness; the accident, therefore, was at once pronounced a dislocation on the pubes. My colleague, Mr. Callaway, under whose care the patient was placed, succeeded in reducing the dislocation by the following means:—Having first bled the patient to approaching syncope, and maintained that state by repeated small doses of tartarized antimony, he had the patient conveyed into the Operating Theatre; where placing him on the table on his sound side, and by means of the pulleys making extension in the direction of the long axis of the dislocated thigh for about twenty minutes, at the same time, raising the head of the bone, by a towel placed under the upper part of the limb, the bone slipped into its place.

It should be observed, that the line formed by the extending and counter-extending forces are nearly parrallel with the position of the body in this dislocation, and that the head of the patient is posterior to the cords which are attached to the girth, for the purpose of fixing the pelvis. Neither should it be supposed that the position of the extending forces is arbitrary, but as much under the observance of scientific principles, deduced from physiological and anatomical knowledge, as the administration of medicines to subdue irritability, are subservient to the knowledge of therapeutics.

We possess in the Museum of Guy's Hospital, a preparation in which the head of the femur is thrown from the acetabulum, and lodged in a situation differing from any that I have hitherto described, and one that is not mentioned by authors as a dislocation to which the hip-joint is liable. The head of the bone is lodged in the notch between the two anterior spinous processes of the ilium, where a new cotyloid cavity has been produced; the original one, having undergone a proportionate change, proving that there is a period at which it would be wrong to attempt reduction. This dislocation appears to me to be a species of dislocation on the pubes, but that the capsular ligament has prevented the head of the bone passing so far forwards and inwards.

Dislocations of the Knee-Joint.

The most frequent dislocation, to which the knee-joint is liable, is separation of the patella, from its articulatory surface with the femur.

Dislocations of the Patella.

Boyer, in speaking of these accidents, describes that the patella may be luxated upwards, downwards, inwards, or outwards; but says, at the same time, that the two last only, properly speaking, merit the name of luxation. Sir Astley Cooper says, the patella is liable to be luxated in three directions—outwards, inwards, and upwards; but according to the common acceptation implied by the term dislocation, I should consider the displacement upwards and downwards as rupture of the tendons of the extensor muscles of the knee-joint, or of the ligamentum patellæ. The dislocation of the patella inwards or outwards is caused by the application of some force upon either of its edges, so as violently to drive it in one of these directions; producing at once, an incapacity of bending the knee, and presenting a projection which renders the nature of the accident sufficiently obvious.

The dislocation *outwards* is the most frequent; it is, however, scarcely ever complete, being usually thrown upon the

articular face of the external condyle, and not upon its outer surface. This accident is generally produced by a blow on the inner edge of the patella when the foot is everted, or in some persons, who are very in-kneed, the displacement may be produced, merely by the action of the extensor muscles of the leg, in whom also there is generally a relaxation of the ligamentum patellæ, rendering them particularly liable to this accident. Boyer speaks of the form of the external condyle of the femur as a predisposing cause to the displacement of the patella, and mentions the cases of three military conscripts, who were the subjects of this malformation, and had consequent displacement of the patella from their birth. If the dislocation be complete, the anterior surface of the patella must be turned outwards, its articulatory or posterior surface inwards, its internal edge must be directed forwards, while its outer edge has the opposite direction; and the knee presents, on viewing it anteriorly, a deep depression, pointing out how completely the displacement of the patella deprives the joint of its wonted protection.

The dislocation *inwards* differs no further from the preceding accident, except that the projection is situated at the opposite side of the joint; but however, the diagnostic marks, the mode of treatment, and the result of the accident, are similar. The peculiar direction of the knees inwards, prevents this dislocation occurring so frequently as that outwards. The mode of reduction, when the patella is thrown from its relative position, with the articulatory surface of the femur, must be at once obvious; namely, to place the only opposing force, the extensor muscles of the leg, in a state of relaxation, which may be effected by laying the patient in the horizontal position, with the injured leg extended, but the thigh flexed upon the pelvis: while in this position, the patella is to be forced by the surgeon, either inwards or outwards, according to the direction of the luxation. These means should be employed as soon after the accident as possible, or the inordinate contraction of the

irritated muscles may render its coaptation difficult; bandages should afterwards be applied to preserve the bone in its natural position, from which it otherwise has a great tendency to be again easily displaced.

Of the dislocation *outwards*, I have seen several instances, both in public and private practice; but generally they have been the result of the action of the extensor muscles of the leg, from an unnatural direction of the knee inwards, and not from the application of any force immediately upon the bone itself.

A young lady consulted me, who frequently dislocated her right patella outwards, merely by striking her toe against the carpet, and once or twice it has occurred while dancing; she has always been able to reduce it by straightening her limb to the fullest extent, and then in bending down to grasp the patella, (she unconsciously relaxing the extensor muscles,) has had no difficulty in pushing the bone back into its place. She described to have suffered extreme pain while the patella is displaced, and is perfectly incapable of locomotion.

There was lately a boy in Stephen's Ward, who, in falling out of bed, dislocated his right patella outwards. It was, however, readily reduced in the manner which has been described. This boy was the subject of hip disease on the right side, and therefore, the consequent inward direction of his knee, rendered him particularly liable to the accident.

Dislocation of the Tibia from the Femur.

The complete displacement of the tibia from the femur, in consequence of the size of their articulatory surfaces, can scarcely happen, unless indeed, it be the result of so extensive an injury as to require immediate amputation, or from the protracted influence of long continued disease. It is described, however, that the tibia may be displaced, either forwards, backwards, or laterally, as respects the femur.

In the lateral dislocations, from the great width of the articulatory surfaces of the bones in that direction, it is next

to an impossibility that it should be complete; but the extent of displacement is such that in the dislocation inwards, the internal condyle of the femur is received upon the outer articulatory surface of the tibia, and when displaced outwards, the external condyle of the femur rests upon the inner articulatory surface of the tibia; in either of these cases, the appearances are precisely similar, excepting in the situation of the projection. The nature of this accident is rendered perfectly clear by the peculiar deformity of the limb, and the reduction is best effected by making extension on the leg and counter-extension upon the thigh, when the knee is semiflexed; when, by pressing the tibia and femur in opposite lateral directions, the coaptation is readily produced.

CASE.

James Plunkett, aged 45, was admitted into Accident Ward, May 18th, 1833, in consequence of having injured his knee, while landing some coals at Dowgate Dock. The accident occurred from his falling off a ladder with a sack of coals upon his back, for the distance of two or three feet, with his left knee bent under him, as he describes nearly at a right angle. Upon his admission, the knee was found to be in its natural position; his fellow-workmen said that great deformity had been produced by the injury, but that he had restored the joint to its natural form, by getting one workman to extend the leg, while he pushed a "lump," the head of the tibia, outwards into its natural situation. The account he gave, in fact, left no doubt that the accident had been a dislocation of the tibia inwards. It was ascertained that the internal lateral ligament, and some fibres of the vastus internus muscle, had been ruptured: this was indicated by an unnatural hollow on the inner side of the knee-joint, opposite to the space between the two bones. From the extent of the displacement which had been described, it was most probable that the crucial ligaments were torn through. The patient complained of great pain, either upon motion of the limb or the slightest pressure; and although, at the period of his admission, there was but little swelling of the knee, tumefaction came on rapidly in a short time. The limb was immediately placed on a double inclined plane, and secured by a roller loosely applied at the foot; and at the lower part of the thigh, twenty leeches were applied, and evaporating lotion ordered to be kept constantly on the part.

On the evening of his admission, the knee, leg, and thigh, were much swollen, with a sensation of considerable heat; the bowels had not been

opened since his admission; he was therefore ordered to take the following medicine:—

℞ Hydrarg: Submur: gr. iij.
Ext: Coloc: Comp: gr. v.
Antim: Tartariz: gr. ¼. M.
Ft. pil: ij. stat: sumend.

May 19th.—Swelling of the limb still increasing, and there is now, obvious, a considerable ecchymosis at the upper part of the calf. Twenty more leeches were ordered to be applied, and to continue the evaporating lotion.

20th.—Is much better in every respect; swelling and heat of the limb diminished, and he complains of little or no pain.

26th.—Swelling nearly gone, excepting at the upper part of the calf, where the ecchymosis is still considerable; there is some hardness and swelling perceptible in the situation of the saphena major vein, leading to the supposition that it had been torn through in the accident, and which was further indicated by the enlargement of the collateral venous branches. The patient went on gradually improving from this time, and by the 3rd of June the inflammation of the joint had entirely subsided; the whipcord hardness of the saphena had diminished, and at the end of June he left the Hospital able to walk with a stick.

My colleague, Mr. Key, admitted a patient a few days since, who had been the subject of partial dislocation of the tibia inwards, attended by laceration of the internal lateral ligament, and some lesion of the vastus internus muscle; it had been readily reduced, and the patient is doing perfectly well.

Dislocation of the Tibia Backwards.

In this case the head of the tibia is thrown behind the condyles of the femur, and rests in the popliteal space; the leg is projected forwards, being permanently and inordinately extended. The patella forms an eminence at the extremity of the femur, immediately under which there is a deep depression, bounded posteriorly by the tubercle of the tibia; the tendinous insertion of the extensors of the leg into the patella is liable to be torn through, and the popliteal vessels are endangered by the pressure of the tibia. The account of such an accident is alone sufficient to give an idea of its severity, and it can hardly occur without being compound.

Dislocation of the Tibia Forwards.

In this luxation the head of the tibia projects in front of the condyles of the femur, which are thrust so deeply into the popliteal region, as usually to compress the artery; the leg is shortened, and permanently flexed; and in this dislocation, as well as in that backwards, the crucial, lateral, and posterior ligaments are torn through.

I have once seen this accident, and the case is related at p. 192, in Sir Astley Cooper's Treatise; in this case amputation was necessary, which, I believe, must invariably occur when the displacement of the articulatory surfaces is complete, and rendered compound by laceration of soft parts.

It is not at all unfrequent to see partial displacement of joints occur from protracted chronic disease, and there is scarcely a Hospital or Museum that does not offer specimens of this kind; but the luxation thus produced is rarely perfect in the ginglimoid joints, although I have been obliged to amputate, in consequence of such displacement of the knee-joint, and in our Museum may be seen some casts illustrative of this fact.

Dislocations of the Astragalus from the Tibia and Fibula.

The articulation between the foot and the bones of the leg is furnished with so many and such strong ligaments, as would lead the anatomist to believe that luxation could hardly occur; and indeed, when we consider the peculiar function this joint has to perform, and the degree of violence to which it is constantly liable, its accidents may be considered comparatively few. When the displacement of their articulatory surfaces does occur, it is always attended with great injury and laceration of soft parts.

The astragalus may be thrown inwards, outwards, forwards, or backwards, from the tibia; but the fibula, having its ligaments so strong in proportion to its size, is usually fractured, instead of the ligaments which connect it with the astragalus being ruptured.

Dislocation of the Astragalus inwards.

This is the most frequent luxation, in consequence of the malleolus internus not descending so low as the external. The degree of deformity prevents the possibility of mistaking the nature of this accident. The sole of the foot is directed outwards, the inner edge only resting upon the ground, the internal malleolus projects upon the inner side of the articulatory surface of the astragalus, over which the skin is so stretched as to threaten its laceration; the fibula is broken from about an inch and a half to two inches above the ankle-joint, and the lower portion is drawn inwards with the astragalus, so as to lose its natural parallel direction with the tibia. If this accident occurs to a person falling from a considerable height upon his feet, the tibia as well as the fibula is liable to be fractured immediately above the malleolus internus, and the astragalus also is sometimes split, which leads to an unfavourable prognosis. It sometimes happens that when the astragalus is dislocated inwards, it may also have a tendency to be thrown forwards or backwards at the same time; a circumstance indicated by the comparative shortening or lengthening of the foot, and unnatural appearance of the heel.

The mode of reducing the dislocation of the astragalus inwards, is to place the patient in the recumbent posture, lying upon the injured side, the leg being bent at a right angle with the thigh, and the foot extended for the purpose of perfectly relaxing the gastrocnemii muscles; an assistant is then to make extension from the foot, at the same time directing it inwards, while the surgeon is to press the tibia outwards, when usually the reduction is readily performed, the facility, however, depending on the perfect relaxation of the gastrocnemii muscles. I have several times witnessed this accident, and have always found the reduction easy, as the fibula being broken, offers no resistance to the coaptation of the articulatory surfaces; and when speaking of fractures of the fibula, I mentioned the recurrence of a dislo-

cation of the astragalus inwards, merely from the spasmodic action of the muscles, in consequence of splints not having been applied to prevent such an occurrence. This fact sufficiently points out the propriety, immediately after the reduction has been accomplished, of applying two splints, each furnished with a foot-piece, so as to keep the foot protected from the influence of the muscles. Should there be subsequent inflammation, local, or even constitutional means may be required. During the process of the consolidation of the fibula, the outer splint should always be worn with its foot-piece, so as to prevent permanent distortion of the foot outwards.

CASE.

James Morris, aged 6, was admitted into Esther Ward, July 26th, 1833, in consequence of an injury he had sustained to his ankle-joint. He stated that while playing with another boy, he was tripped up, when his foot was forcibly thrown outwards, and a considerable projection produced upon the inner ankle; by hopping on the other leg, the child contrived to make its way home, nearly a quarter of a mile distance; he was then carried to the Hospital at Woolwich, where, from his account, by the aid of four men attempts were made to reduce the dislocation, but without success; leeches were then ordered to be applied, and during the first ten days after the accident, six dozen were required to subdue the inflammation; sloughing of the skin now took place on the projection, immediately below the malleolus internus, in which state he was brought into Guy's Hospital a fortnight after the accident. When I first saw the patient, upon examination of the exposed portion of bone, which I believed to be the malleolus internus, the sole of the foot was directed outwards, the natural projection of the heel appeared diminished, while the length of the dorsum of the foot was proportionably increased, and the fibula was broken about an inch above the malleolus externus; from these marks, I was induced to consider it a dislocation of the astragalus forwards and inwards, and agreed with my colleague Mr. Key that it would be right immediately to attempt coaptation of the parts, which I did by placing the patient upon the injured side, flexing the knee, and making extension from the foot, while counter-extension was preserved from the leg; by these efforts there was certainly some change of position of the parts, and upon examining the portion of bone which presented itself opposite to the wound, it was found covered by articular cartilage, presenting an edge, pointing out

the inclination of the astragalus forwards and inwards, the edge being distinguished as the line of union between the articulatory surface for the malleolus internus and that of the lower extremity of the tibia: the attempts at reduction were resumed, but were equally fruitless, the great obstacle appearing to be, the union of the fibula. Some doubt arose as to the propriety of force being employed for the purpose of disuniting the repaired fibula, a violence, however, which I could not bring my mind to employ, but directed that cold lotions should be kept constantly applied to the ankle, to prevent inflammation from the attempts we had made at reduction. It now became a question, whether the limb was to be amputated, the astragalus removed, or the means of reparation left to nature. I determined on the latter,—first, because I considered that as the boy's health was good, and capable of sustaining considerable expenditure, it was better to attempt to save the limb; and secondly, I thought it adviseable not to remove the astragalus, as only so small a portion of it was exposed, that to detach it from the calcis, a very large wound must have been made, and all the concomitant circumstances with the injury aggravated. Sir Astley Cooper saw the case in a few days, and agreed with me that I had adopted the safest course.

August 29th.—There is now considerable discharge from the ankle, but the boy's health is very good, he eats, drinks, and sleeps well, and his bowels are regular, the astragalus appears to be loosening.

Dislocation of the Astragalus outwards.

This accident is usually attended with much more severe concomitants than the last described, comminution of bone, and laceration of soft parts being almost invariably consequent. The prognosis therefore is far less favourable than in the preceding luxation. In this accident, the deformity is truly characteristic of the direction of the dislocation; the sole of the foot being turned inwards, while its outer edge only rests upon the ground, the external malleous projecting so forcibly on the outer side of the foot, as to threaten laceration of the skin. Upon examination, the malleolus internus will be found broken off from the shaft of the tibia, and the fibula fractured in the usual situation; the latter, however, is described by surgeons who have written upon this subject, not invariably to occur, in consequence of the fibulo-tarsal ligaments sometimes giving way, rather than the bone. The

reduction should be effected as quickly as possible after the accident, and usually the antiphlogistic plan is more essential, in this, than in the luxation inwards, in consequence of the inflammation supervening upon the more extensive injury.

The mode of effecting the reduction is to place the patient upon his back, with his thigh flexed upon the pelvis, counter-extension is then to be made upon the leg, while the surgeon makes extension from the foot, at the same time rotating it outwards, and thus the astragalus is readily brought into its natural position, when, the means to be employed to retain it there, are splints furnished with foot-pieces, at the same time employing the local and constitutional remedies necessary to overcome the consequent inflammation of the joint.

In compound dislocations of the astragalus, and even of the extremities of the tibia or fibula, direful as the accident appears, Sir Astley Cooper has proved both as the result of his own experience, and from the accumulated authorities of the numerous high professional characters, which he has published in his treatise on this subject, that amputation is not to be considered as the necessary result of such an injury. He has quoted various cases, in many of which it has been necessary to saw off portions of bone, and even to remove the whole astragalus, and yet has succeeded in saving the limb. I have twice seen the astragalus removed by him, and once by Mr. Green, with perfect success, and the restoration of a useful limb, no defect being the result beyond a stiff ankle-joint, and the consequent halt from walking with a flat foot. The circumstances which render amputation necessary in compound dislocation of the astragalus outwards, are, very extensive laceration of soft parts, and rupture of blood-vessels; when no surgeon would hesitate as to his mode of practice. If, on the contrary, in compound dislocations of the ankle-joint, there be but a small external wound, through which bone is protruding, whether it be tibia, fibula, or astragalus; and if, in consequence of the smallness of this wound, the bone cannot be returned into its situation, it is better to saw the projecting extremity

off, than to enlarge the wound and thus expose an extensive surface of synovial cavity; but when the whole astragalus is exposed, and separated in a great measure from the calcis, if the blood-vessels be not ruptured, and the soft parts too severely contused for the hope of their reparation, the astragalus may be removed, and the tibia and fibula brought in contact with the calcis, between which anchylosis afterwards takes place.

We possess in the Museum of Guy's Hospital three casts of the dislocation of the astragalus: No. 2655 presents in the clearest manner, all the diagnostic marks of this accident, while the two others shew some displacement of the astragalus forwards as well as outwards. Such casts are well worthy the careful attention of the pupil, as he is enabled, by the frequent repetition of their impression on his mind, firmly to establish the character of distortion concomitant with each kind of accident.

Dislocations of the Astragalus, backwards.

This accident is most likely to be produced by the foot becoming suddenly fixed during rapid progression, when the *vis inertiæ* of the body drives the tibia forwards, and produces fracture of the fibula.

The diagnostic marks of this injury, are, shortening of the foot, which is more or less conspicuous on viewing its dorsal surface, in proportion to the extent of displacement from the tibia; the heel presents an unnatural elongation; the foot is fixed in the extended position, and has a tendency to be slightly rotated inwards, from the fibula being broken. This dislocation is sometimes only partial, part of the articular surface resting upon the astragalus, while its anterior portion projects over the navicular bone; the indication of the extent of displacement, as I have before said, is the degree of shortening of the foot, and the elongation of the heel. The cast, No. 2656 in the Museum, correctly demonstrates all the diagnostic marks of this accident. As soon as possible after the injury, the reduction should be performed; for if it

be delayed, severe inflammation increases the difficulty, and in a short time, the permanent contraction of the muscles, and the consolidation of the fibula, will preclude the possibility of restoring the bones to their natural position.

Of the dislocation of the astragalus forwards, I have no experience; and as Sir Astley Cooper has given no history of such an accident, I should doubt its occurrence, excepting under such extensive injury to all the structures of the foot, as would render amputation necessary, and supersede the utility of describing the diagnostic marks.

Dislocations of the Bones of the Tarsus.

The motion of these bones upon each other is so very limited, the surfaces of contact which they present so extensive, and their bond of union so firm, that their luxation is of the rarest occurrence, but still can be produced, as the following cases will illustrate.

CASE.

Dislocation of the Calcis outwards, from the Astragulus.

John Ryley, aged 49, was admitted on the 9th of August, 1833, with dislocation of the foot. He stated, that he was unloading some hops, when he swung himself out of the cart; in doing which, he lost his hold and slipped upon the curb-stone, his right foot being turned completely inwards, in which position it remained until his arrival at the Hospital shortly after; when upon examination the diagnostic marks were as follow:—The chief deformity which presented itself was the complete turning inwards of the whole foot, the sole of which faced directly inwards; the astragalus formed also a very evident deformity, remaining in its natural position with respect to the tibia and fibula, but its anterior articulatory surface pressed so tightly against the skin, that had the dislocation remained unreduced, it must have soon ulcerated; the superior edge of its anterior articulatory surface might be clearly felt, and its form was distinctly visible, a deep hollow was also observed below the external malleolus, where there was evidently most extensive contusion of soft parts; the external malleolus formed a considerable projection in its natural position, but neither was it, the internal malleolus, or any of the bones of the foot fractured.

From the consideration of the above appearances, little doubt existed

as to the nature of the accident, which seemed to be displacement of the calcis and navicular with the rest of the foot outwards from the astragalus. Reduction was effected shortly after his admission in the following manner:—The surgeon kneeling at the foot of patient's bed, grasped the heel with his right hand, while he made extension from the instep with the left, at the same time that the tibia was pressed inwards, towards its natural position by an assistant. The reduction was easily accomplished, when the foot regained its natural form, with the exception of the swelling produced by the extensive injury to the soft parts. The leg was laid upon a splint with a foot-piece on its outer side; two or three turns of the roller were lightly applied over the foot, and below the knee, in order to keep the splint in position. Twelve leeches, and afterwards cold lotions were applied, and the following medicine ordered:—

℞ Cal: gr. iij.
Ext: Coloc: Comp: gr. v.
Ant: Tart: gr. ¼. M.
Ft. pil ij. statim sumend.

10th.—Slept very badly, the leeches and cold lotions have somewhat relieved him, but as there is still great heat, pain, and swelling, he was ordered to apply twelve more leeches, and continue the lotion. His bowels have been opened by the pills.

12th.—The swelling and heat have subsided in a considerable degree, and the patient complains of very little pain; the splints were therefore applied on either side of the leg, and the case went on favourably until the

20th.—When he complained that he was unable to sleep from great pain in the ankle, the splints were therefore removed, and some degree of swelling, with heat and redness, was found just below the external malleolus. The tongue was coated, the skin rather hot, but his bowels open. The inner splint only was now used, and he was ordered to apply twelve more leeches.

℞ Tr. Hyosyami ʒss.
Mist: Salin: ℥iss.
Ft. haust: 4trs. horis sumend.

In the evening, as the inflammation around the outer malleolus was still considerable, twelve more leeches were applied, and one grain and a half of calomel with a grain of opium given.

22nd.—He suffers intensely from the pain, entirely losing his rest; fluctuation being now manifest below the malleolus externus, an opening was made, and about an ounce of ill formed pus discharged. To continue his medicines.

23rd.—Is somewhat easier to-day, did not however sleep well, bowels open; tongue furred, and rather dry; pulse 110, irritable. The fluid

discharged from the wound, seems to be of a nature, somewhat resembling altered synovia.

℞ Cal: gr. iss.
Opii gr. ss. M.
Ft. pil. statim sumend.
℞ Mist: Efferves: ℥iss. 4trs. horis sumend.

24th.—Has had very little sleep, tongue furred; skin hot; pulse 108, weak and irritable; bowels rather confined; great restlessness.

℞ Ol: Ricini ℥ss. statim sumend.

25th.—Still complains of want of sleep, bowels freely opened by the castor oil; pulse remains quick and weak; tongue coated; skin hot, but rather moist.

℞ Cal: gr. iss.
Opii gr. ss. M.
Ft. pil. stat: et hor: som: sumend.

26th.—Seems slightly improved to-day, slept a little last night; bowels open; tongue furred, but moist at the edges; much less pain and thirst; the wound continues discharging fluid of the same character. Rep. Cal: c Opii stat: et hor: som.

℞ Ammon: Carb: gr. iij.
Sodæ Subcarb: ℈j.
Liq: Opii sedat gtts. x.
Aq. Menth: vir: ℥iss. M.
Ft. haust et adde Limon: succ: recent: ℥ss. in statu efferves: 4trs. horis sumend.

29th.—Is much improved by the last medicine. Has slept well; the irritative fever is considerably abated, the wound continues discharging; bowels regular; tongue coated, but moist; pulse 96, rather improved in tone, having lost much of its irritability.

℞ Pulv: Doveri, gr. v.
Pulv: Rhei: gr. iij. M.
Ft. pulv. ter die sumend.

The foot was now placed on the heel, with a splint on the inner side, the whole being considerably raised by pillows.

September 3rd.—Has now entirely lost his fever, very little or no pain in the joint; pulse quiet, and amended in tone; tongue cleaner, and moist; skin moist; sleeps better. The limb to continue in the same position.

8th.—Doing very well; sleeps comfortably; no pain; bowels open; pulse quiet; appetite good; tongue cleaner; there is now no discharge from the wound, and a fair promise for a speedy recovery.

Sir Astley Cooper has given an account of two dislocations of the os cuneiforme internum, and in neither of these cases could the bone be reduced; one of them occurred while I was a dresser at Guy's Hospital, and the diagnostic mark of the accident was a projection inwards of the internal cuneiform bone, giving the appearance of displacement of the toes outwards; although the bone could not be pushed back into its natural situation, the patient suffered but little inconvenience from the accident.

The dislocations of the metatarsus, and of the phalanges of the toes, are accidents even of rarer occurrence than of the carpus and phalanges of the fingers; which depend more upon the difference of the function they have to perform, than upon their being more securely articulated with each other. Such accidents, however, do sometimes occur, either from a very heavy weight falling upon the foot, or a carriage passing over it, generally producing, at the same time, such comminution of bone and destruction of soft parts as to render amputation necessary. Should, however, dislocation of the phalanges occur without any such complication, reduction should be attempted in the same manner as described in the dislocations of the phalanges of the fingers.

In summing up, the principal point as a diagnostic mark by which dislocations may be known from other accidents, may be said to be, the immobility of the injured joint; and this will be found to form the point, from which the surgeon should commence the scrutinizing investigation, necessary to ascertain the situation of the dislocated bone, the extent of its displacement, the length of time which it has been luxated, and the concomitant injuries to the surrounding parts.

ON

WOUNDS AND INJURIES OF THE ABDOMEN.

In a surgical point of view there is no part of the human body, which, under injury, leads to more important considerations, and requires more knowledge in anatomy and physiology, than the treatment of lesions of the abdomen and its contents. The cavities of the body, if generally considered, are for the purpose of defending the important organs which they contain from external injury; and so far the cavity of the abdomen is similar to that of the cranium and chest. It is right, however, to observe, that the capacity of the abdomen is not only much greater than that of either the skull or chest, but its size is less determined, in consequence of its parietes being made up almost entirely of soft parts; while that of the skull is completely formed by the bones of the cranium, and the capacity of the chest limited to the motion of the ribs and sternum. Here then a considerable difference arises for the judgment of the surgeon, when these cavities are the subject of injury; in the firm, contracted, bony, and fixed parietes of the head, slight depression, effusion, or any circumstances which tend to occupy space in the skull, immediately produce such functional disturbance as threaten destruction to the individual. In injuries to the thoracic parietes, bounded as they are by an ossific barrier, still the mobility of its bones (essential to the function of the viscera contained within the chest), admits of a considerable degree of diminution in the capacity of this cavity, whether from effusion or any other cause, without such immediate or alarming symptoms as follow the slightest diminution in the capacity of the skull.

The cavity of the abdomen, surrounded as it is by muscles,

capable of undergoing great changes, so as to admit of increase or diminution of its capacity, permits of alteration in its size, without being attended with the same danger, as occurs in the cranium or chest; but still the slightest circumstance which interferes with the various important organs, which are contained within the abdominal cavity, renders it highly necessary, systematically to consider the effects of injuries upon the abdomen and its contents.

In the first place, let it be remembered, in a physiological point of view, that the cavity of the abdomen contains the organs of digestion, with their assistants, the chylopoietic viscera; the organs for the secretion and excretion of urine, and the internal organs of generation; by anatomy, the relative position of these organs with respect to each other, can alone be understood; and by symptoms which deviate from their natural function, as well as by the situation of an inflicted injury, the accomplished surgeon is capable of forming a diagnosis in these cases.

Between the muscular parietes of the abdomen and the viscera contained within the cavity, there is placed a serous membrane, which, from its peculiar tendency to adhesive inflammation, forms an object of the greatest interest, not only in reference to the degree of danger accompanying accidents, but also with respect to the treatment, and even to the classification of abdominal wounds.

Thus, wounds and injuries of the abdomen have been considered under different heads, for the purpose of facilitating the diagnostic and prognostic marks, as well as the treatment of each individual case; *first*, simple contusion of the abdominal parietes; *secondly*, wounds of the parietes; *thirdly*, wounds of the parietes, with protrusion of the viscera; *fourthly*, wounds of the parietes and viscera; and *fifthly*, laceration of the viscera, without solution of continuity of the parietes.

In the first class of injuries, namely—mere contusion of the parietes, it generally happens, that no other injury is sustained than mere concomitant pain, as in contusions of

other parts of the body; and that fomentations, rest, and an antiphlogistic regimen, will be found sufficient to restore the patient to a state of health. This happy result is not, however, the invariable sequel; but on the contrary, urgent symptoms sometimes may follow, even to collapse, so as to render it extremely difficult for the surgeon to form his diagnosis; under such a difficulty, he should prudently withhold his prognosis until reaction has taken place, and which, perhaps it may be right to assist by the application of warmth and the administration of stimuli. Upon the early or later period at which reaction occurs after the infliction of such an injury, and upon the absence of relapse after the patient has recovered his powers, will the surgeon be induced to form his judgment of the injury being simply of the parietes, or complicated with lesion of the viscera. When the natural action of the heart is restored, the general heat of the body returned, and the fear of a relapse removed, an active antiphlogistic plan should immediately be adopted; for in these cases, there is more to dread from the subsequent than the immediate effects of the injury, in consequence of the extreme liability of the peritoneum to become inflamed; a circumstance almost invariably concomitant with all injuries to the abdomen, and one too which proves so frequently fatal. Therefore, bleeding, rest, a perfectly flexed state of the abdominal muscles, and a strict antiphlogistic regimen, are to be had recourse to, to prevent this tendency to inflammation; for he is to be condemned who having committed an error, would allow the symptoms of inflammation to appear, and then apply as a remedy, what might have been used as a preventive.

In such cases as belong to the first class of injuries to the abdomen, the patients almost invariably recover by the adoption of the preventive means which have been employed; and therefore, no detailed account has been preserved of these usually trivial accidents.

When the parietes of the abdomen are wounded, but without either protrusion or injury to its contents, there is

but little difference to be observed in the treatment, from that of the last class of accidents, excepting that the edges of the wound are to be brought together by suture, and maintained in perfect apposition by plaister and bandage: attention is to be paid to the relaxed state of the abdominal muscles, and to the strictest observance of the antiphlogistic regimen. When subsequently to injuries of the abdomen, in either of the above classes, there be excessive pain, it has been recommended that leeches should be applied to the anus, so as to unload the hæmorrhoidal vessels; a plan much adopted on the continent. If however, the injury to the abdominal parietes has been caused by a cutting instrument, and is attended with such severe symptoms as would lead the surgeon to believe that the intestine is wounded, he should avoid minute examination, or exploring for the nature of the accident, and also refrain from securing the edges of the wound, with the same exactitude as if there was no reason to believe that the intestine was wounded, leaving a sufficient opening for the discharge of the fæcal matter. In such a case, purgative medicines should not at first form a part of the antiphlogistic means employed, at least, not for the first six hours after the accident, as by this delay time is given for the intestine, should it be wounded, to adhere to the opening through the parietes; so as to close the peritoneal cavity, and prevent fæcal discharge into it, which would be rendered inevitable by the immediate administration of purgatives. Should the alarm prove to be unfounded, means are to be employed for the purpose of uniting the wound of the abdomen as quickly as possible; and afterwards bandages, or any apparatus which may be considered best capable of supporting the abdomen, should be worn, as there is always a great tendency in those cases to ventral hernia, from the yielding of the cicatrix. When the viscera protrude through the wound in the abdomen, a new consideration arises at once in the mind of the surgeon, as to the fit state of the protruded viscus to be returned into its natural cavity. Hence the propriety of cau-

tiously examining whether the intestine has been wounded by the instrument which produced the injury, or undergone any change from the length of time it may have been exposed to the atmosphere, or constricted by the small size of the opening through which it has passed; when, if it be found, that it has neither suffered from any mechanical, or vital cause, it should be returned as quickly as possible into the abdomen, the wound through the parietes being enlarged, if necessary, to facilitate this operation. The edges of the wound are then to be brought together, and retained there by sutures; thus treating this as the second class of injuries to the abdomen, to which in fact, it is now reduced. Should any doubt still exist in the surgeon's mind, as to the propriety of returning the intestine into the abdomen, either from its colour, coldness, loss of elasticity, or any change either in its physical or vital properties, it is then that he is to weigh duly in his mind the chances of reparation of the part, considering equally the constitutional, as well as the local powers; and if with all his judgment he should still doubt, I feel disposed to lay it down as a general rule, that with that doubt on the mind, the intestine should be returned into its natural cavity. It is there, under the influence of its natural warmth, that its vital energies are best maintained, and will be most likely to be restored.

Caution must, however, mark the return of the intestine into the abdominal cavity, care being taking to leave the most injured portion nearest to the wound in the parietes, so that should nature fail in her attempt at reparation, an exit for the contents of the intestine may be secured. Such a difficulty in determining on the propriety of returning a morbidly changed viscus into the cavity of the abdomen, often occurs to a surgeon in operating for strangulated hernia. I have frequently felt this difficulty; and from experience should say, that I have never had to regret the return of intestine into the abdomen, or otherwise than to regret when I had left it in the hernial sac. When after a wound to the abdomen, the protruded viscus has been returned, general bleeding, and

leeches should be employed; but purgative medicines should not be administered for the first few hours, and then small doses of neutral salts, with peppermint water, will be found the most efficient medicine, assisted by oleaginous clysters; the greatest attention should also be paid to the diet,—nothing being allowed but thin gruel, so as to prevent any accumulation within the intestine. It sometimes happens, that immediately on the infliction of a wound to the abdomen, vomiting occurs, which may require medicinal means to check; sinapisms to the stomach are, perhaps, the best means that can be employed.

CASE.

About two years since, a man was brought into Guy's Hospital, in consequence of very severe injuries which he had received, while in the act of stealing lead from the top of a brewery, from which he fell. Upon examination, it was found that he had torn open an old scrotal hernia, and a considerable quantity of intestine protruded, and had remained exposed for nearly an hour; one of his thighs was also broken, and his left shoulder dislocated. The intestine was immediately returned into the cavity of the abdomen, and the edges of the wound brought together by the uninterrupted suture; the fractured thigh was placed in splints, and the dislocated shoulder reduced, which was accomplished with much more than usual facility, in consequence of the state of collapse of the patient from his abdominal injury. His pulse being feeble, the surface of his body cold, and his respiration difficult, julep ammon: was administered, and bottles of hot water applied to his feet, for the purpose of producing re-action, which was no sooner effected than pain in the abdomen came on, for which leeches were applied, and calomel with opium given, for the purpose of allaying his pain; all the symptoms, however, rapidly increased in urgency, and in fifteen hours after his admission he died.

Upon examination of his body, it was found that he had been the subject of severe peritonitis, demonstrable from the quantity of coagulable lymph which was poured out; the portion of intestine which had protruded had not been ruptured, nor were there any signs by which it could be known from the rest of the intestines, but from a slight degree of thickening, probably from its frequent descent into its old hernial sac. The diaphragm was found ruptured, and a considerable portion of the stomach protruded into the chest, a circumstance of which there was no suspicion from the symptoms during life.

Several cases are on record of viscera having protruded through incised wounds of the abdomen, in which they have been returned into their natural cavity, and without any alarming symptom supervening, where a strict antiphlogistic discipline had been employed for the purpose of preventing inflammation. I have heard my colleague, Mr. Morgan, relate a case, in which a boy at Tottenham received a wound in the abdomen, through which a large quantity of intestine protruded; he placed the viscera in his pinbefore, and walked a considerable distance to a surgeon, who freed the bowels from a quantity of dust which adhered to them, returned them into the cavity of the abdomen, and sewed up the wound by the uninterrupted suture; by this judicious treatment, the patient was restored to health.

This, and several such cases have occurred, in which the peritoneal cavity has been opened, both as the result of accident and operation, and without any serious results. Hence it has been inferred by some surgeons, that no great danger is to be dreaded from the infliction of any injury upon this great splanchnic serous membrane: but, however, let any surgeon hesitate before he allows his mind to come to such a conclusion, and let him, if without opportunity from his own experience, learn from the experience of others, the result of operations on strangulated hernia; when he will find, that the cause of failure is not so frequently from the mechanical or vital injury which the bowel has sustained, as from the morbid change produced upon the peritoneum; so that although the healthy peritoneum will admit of being punctured, cut into, and extensively separated, in many of the operations of surgery; yet, when morbidly changed by inflammation, that the slightest injury produces the most fatal effects; and I agree most perfectly with my colleague Mr. Key, in considering it of the greatest importance to return the contents of the hernial sac into the abdomen, without opening it, when this can be effected. There are some who make objection to this plan, from its preventing the opportunity of examining the real state of the intestine

itself, but I believe the appearance of the hernial sac, and the feel of its contents through it, will allow the surgeon to form nearly as correct a judgment as if he could see the part; at any rate the additional evidence is purchased at too dear a rate, if it can be returned without being exposed; and as Mr. Key very properly asks, who would hesitate to return a strangulated hernia by the employment of the taxis, instead of cutting down upon the part and first examining the intestine? unless indeed, there were, as there might be, outwards signs of sphacelus or rupture from some other cause. I must also say, that I believe it will frequently be found, from adhesions, and other causes, that the contents of a hernial sac cannot be returned, unless the peritoneum be opened; but however true this may be, and to whatever extent, still it does not diminish the value of the proposed step, where the performance of it is admissible.

In the still further aggravation of injuries to the abdomen, it may happen, not only that the parietes should be wounded and its contents protrude, but the viscera themselves may also be injured; and there can scarcely be in surgery a greater difficulty than in this kind of accident; a difficulty, which frequently presents itself in cases of strangulated hernia, when the intestine has given way either from sloughing or ulceration. What is the treatment to be pursued in these cases? either is the intestine to be returned into the cavity of the abdomen, and the edges of its wound left as near as possible to the opening through the parietes, leaving it to nature alone to secure it there by the adhesive inflammation; or is the surgeon by means of suture through the bowel itself, or the mesentery, to fix it there? From my own experience, founded upon dissection, as well as upon experiments on the lower animals, I am inclined to come to the following conclusion, and to recommend that the means to be employed should be regulated by the nature of the injury inflicted upon the intestine:—If the wound of the intestine be through the whole of its calibre, extending to the mesentery, or at any rate, implicating a large portion

of the cylinder, I then should recommend suture; dangerous as it may seem to be, it is yet to be considered the only means left to secure the position of the intestine, near to the outer wound; but if on the contrary, when the wound extends only through a small portion of the calibre, the suture need not be used, for nature immediately, by the adhesive inflammation, not only unites the edges of the wound of the intestine and parietes together, but also by the same process provides a perfect barrier to the discharge of fæculent matter into the cavity of the abdomen. It not unfrequently happens, where the opening into the bowel is small, that its calibre is immediately re-established by the union of its edges to the parietes of the abdomen, without communicating with the external wound; generally, however, the mode of reparation is more protracted, and an artificial anus is first produced, the obliteration of which becomes the subject of further treatment, and usually by the judicious application of mechanical and constitutional means, it may be effected.

I have made several experiments in the endeavour to draw some just inference as to the best mode of treatment, in cases of protruding wounds of the intestine; but I fear, from the experiments being made upon lower animals, there is much danger in drawing too hasty deductions from any supposed analogy between the condition in which the human subject would be placed under the same circumstances with them; at any rate, I discovered that the difficulty in preventing the escape of fæces into the abdomen, was exactly in proportion to the size of the opening in the intestine; and would recommend that where the opening was large, whether from accident or disease, as in cases of strangulated hernia, that sutures should be employed in such a manner as to prevent any portion of the wound opening into the cavity of the abdomen. I have never seen an accident of wounded parietes of the abdomen, with protrusion of injured intestine, except in cases of gun-shot wounds, which were removed from my care immediately, and have left no

further impression upon my mind, than the recollection of the immediate prostration which follows such accidents. I shall, however, describe two or three cases of strangulated hernia, in which the intestine had been found either sphacelated or ulcerated; and leading, therefore, to the same surgical considerations as belong to this class of abdominal injury.

CASE.

James Crew, aged 56, was admitted into Guy's Hospital, the subject of a strangulated scrotal hernia, from which he had suffered with insuperable constipation for nine days. The patient was immediately put in a warm bath, had a small quantity of blood taken from his arm, and the taxis employed without any benefit: the operation was therefore immediately proposed and consented to. Upon laying open the sac, a large portion of crispy, dark-coloured, omentum was exposed, covering a considerable knuckle of intestine, which adhered to the sac by recent depositions of lymph, but was readily separated from it. I then freely divided the stricture, and on examining the state of the strangulated bowel found it dark-coloured, but its physical qualities did not in my mind indicate sufficient loss of vital power, as to induce me to leave it within the hernial sac; feeling then, as I now do, convinced, that if there be any chance of the restoration of the bowel, that chance is much increased by its return into its natural cavity, which I therefore effected, removing at the same time the protruded omentum, which from its consolidation, would have probably acted as an extraneous body. The intestine was left as near as possible to the mouth of the sac, and the wound being dressed, the patient was put to bed, when he immediately began to describe a sensation of cold and shivering; his pulse was feeble, and his body bedewed with a cold clammy perspiration; bottles of hot water were applied to his feet, and brandy, with julep ammoniæ given. From this treatment he rallied, and seemed to be easier; but in the middle of the night he was seized with a violent pain in the abdomen; collapse came on about five in the morning, when he died.

Upon examination of the body after death, the pelvis was found nearly filled with fæculent matter; and upon searching for the opening in the intestine, through which it had escaped, a small ulcerated orifice was found, accounting at once for the sudden dissolution of the patient. The character of an opening in an intestine, will always shew whether it has been the result of violence or of disease; if of violence, the opening presents a thickened protruded edge, produced by the eversion of the mucous membrane (*vide Plate 4, fig. 2*); while on the contrary, if it be

ulcerated, the opening presents a thin edge, terminating by peritoneum instead of mucous membrane, in consequence of the much greater rapidity with which ulceration goes on in the mucous, than the serous membranes.

I have described this case, on account of its being instructive in pointing out the necessity of learning the external marks by which an intestine shews its degree of disorganization; words can hardly express what experience teaches, but the peculiar elasticity, thickness, natural colour, and degree of warmth, are the means by which this important point is to be ascertained. One of the most certain signs, perhaps, in cases of strangulated hernia, as to the degree of vitality of intestine, is its power of regaining its colour as soon as the stricture is divided, a circumstance which points out at once the propriety of returning such intestine into the abdomen.

The next case shews how large a quantity of omentum may be removed, and yet the patient recover.

CASE.

Edward Apps, aged 30, a labourer, had been the subject of rupture for nine years, and had always been able to return it by placing himself in the recumbent posture, until about four days ago. Upon his admission into Guy's Hospital, a large scrotal hernia presented itself, which baffled all attempts at reduction, although bleeding and a warm bath were called in aid; the tumour was large, tender, and dark-coloured; and although the symptoms of strangulated hernia were not urgent, leading me to the belief that omentum only was in the sac, still I recommended him to submit to the operation, which he readily consented to. Upon the sac being laid open, a considerable portion of omentum was found to be contained within it, so altered in its structure as to render it unfit to be returned into the cavity of the abdomen. I therefore removed a portion weighing seven ounces, and the patient ultimately did perfectly well, although he was afterwards seized with some slight tendency to peritonitis.

It may be at first thought, that these cases are not illustrative of the class of injuries to the abdomen which I am now describing; but I look upon the surgical considerations of each, so analagous as to admit of my referring to them in illustration of the doctrines which I have laid down.

In removing omentum, either in cases of hernia or protrusion from external violence, care must be taken in excising it not to cut through the vessels in which the blood still retains its fluidity, or else there will be occasion for the application of ligatures, which must diminish the hope of recovery from their tendency to produce peritoneal inflammation, and if they be not applied, the danger is equal from the effusion of blood into the cavity of the abdomen.

The fifth and last class of injury to the abdomen to be considered, is that in which the viscera are ruptured or lacerated, without any wound in the abdominal parietes. Such accidents are not very uncommon, but produce, as direful effects as the last class, and without offering the same hope of remedial assistance. The symptoms which are produced by the rupture of an intestine, or indeed, any of the important viscera, from a blow on the abdomen, are usually sufficiently well marked to point out the precise nature of the injury which has been sustained. From a state, perhaps of robust health, the patient is at once reduced to the most hopeless state of prostration; the cold sweat which overspreads his body, the ghastly anxiety of the countenance, the scarcely to be felt pulse, and the patient's own conviction of approaching death, all forebode the fatality of the injury; and one of the common expressions of the sufferer is, that all medical efforts are in vain, for that he feels "struck by death." Such urgent symptoms, perhaps somewhat less violent in degree than what I have described, do, however, sometimes supervene upon a blow on the abdomen, without any rupture of a viscus having occurred; indeed, many cases are on record of persons having dropped down dead, from only a slight unexpected blow on the scrobiculus cordis, and without the cause of death being afterwards apparent: so sometimes does a blow produce collapse immediately on the infliction, the effects of which, however, are transitory, and re-action comes on, either spontaneously, or, perhaps, may require the assistance of stimuli; therefore a surgeon is not always in these cases to

consider collapse as indicative of a hopeless state. In such cases as those in which re-action takes place, the antiphlogistic regimen should be adopted, so soon as the pulse and return of the natural warmth of the body point out the restoration of the vital powers; and this with the view of preventing peritoneal inflammation, which is so likely to follow. Purging however, is not to be the means employed for subduing, or rather keeping down inflammatory action; for should an intestine have received such an injury from the blow, as to tend to its ulceration, although it may not have ruptured it, the employment of purgatives by increasing, as they do, the peristaltic motion of the bowels, would disturb the means by which nature could repair the hurt which the intestine had received. So that I should say, in cases of supposed ruptured intestine without a wound in the parietes of the abdomen,—in cases of wounded and protruded intestine, —in cases of ulcerated intestine, in strangulated hernia,— or even in the case of ulceration of a bowel, caused by protracted chronic inflammation; in all, purgatives should be avoided, at least, until time has been given for nature to exert her efforts, undisturbed, to repair the direful injury, although in each, should re-action come on the antiphlogistic plan must be adopted.

On one occasion I was sent for into the country, to visit a young man of two and twenty who had been only a few days ill, and was then suffering from constipated bowels, attended with severe pain and disturbed state of the abdomen. Upon examining fully the history of his case, I found that he had been frequently the subject of irregularity of bowels, attended with continued pain in one spot, as well as to the motions being tinged with small quantities of blood. From this I inferred that he suffered from ulceration in some part of his intestinal canal, and the question was, whether or not the ulcer had penetrated through the parietes of the intestine, and that fæculent matter had made its escape, or whether the process of reparation was yet going on. As prostration did not mark the giving way of the bowel, I

could not bring my mind to believe that it had occurred; and as there was sufficient power to admit of loss of blood, I ordered leeches to be applied to the abdomen, gave a large dose of opium, with James's powder, and requested that no purgative should be given until the next morning, and then only by way of injection. A drastic purge was, however, administered, soon after I left the house, and three hours after he had swallowed it, he was seized with violent pain in the very spot in which he had always suffered; his abdomen became suddenly distended, excessive prostration immediately followed, and in two hours he died. I do not mean to attribute his death entirely to the administration of the drastic purge, because there was little probability of recovery; but yet I do mean to say, that the only chance there was for him, was much diminished by its effects.

CASE.

George Private, aged 30, was brought into Guy's Hospital, Nov. 3rd, in consequence of an injury he had sustained from a lightly-laden cart having passed over his abdomen. In the evening I found him lying on his right side, with his knees drawn up, and his head and shoulders inclined forwards; he complained of violent pain attacking him in paroxysms, like those of colic, attended with great tenderness diffused over the whole abdomen. His abdominal muscles were strongly contracted and tense; his expiration was accompanied by a deep sigh; he had twice vomited, and upon one occasion, a small quantity of blood; his pulse was not accelerated nor feeble, and his skin perfectly warm: leeches were applied to the abdomen, fomentations were also ordered, and thirty drops of tincture of opium were given.

At 10, P. M.—Vomiting continued; had passed his urine which was not bloody. A grain and a half of calomel and a grain of opium, were taken directly.

Nov. 4th.—The pains had been violent during the night, but he had some sleep towards the morning; the degree of tenderness upon pressure of the abdomen much the same as yesterday; he still had constant nausea, at times amounting to vomiting, and the peculiarity of his respiration continued; his pulse were eighty-four, neither small nor compressible, but on the contrary, resisted the pressure of the finger to a degree amounting to hardness; his tongue was covered with a slight brown fur. Twelve more leeches were ordered to be applied to the abdomen, a grain

and half of calomel with a grain of opium, to be taken directly, and a castor oil injection administered.

At 6, P. M.—The vomiting had subsided, only a small quantity of bile having been ejected by eructation; he described himself as feeling easier in every respect, and slept at short intervals in the early part of the day, but towards noon the pain in the abdomen increased, his pulse rose to 110, and became softer; the tongue was certainly cleaner; as yet had no evacuation from the bowels, and not being able to pass his urine, he requested to have it drawn off; a catheter was accordingly introduced, and a small quantity of healthy urine was removed; a castor oil injection was then ordered, and to be repeated every two hours until an evacuation was produced, immediately upon which, a draught of forty drops of laudanum and an ounce and a half of camphor mixture was given.

At 10, P. M.—After the second injection a motion was procured, containing a small quantity of blood, when immediately he complained of a great increase of pain in the right hypochondriac region, which was greatly aggravated by inspiration. Respiration was now completely thoracic; he continued to lie upon his back, inclining to the right side, pale and anxious; his pulse 126, very small and compressible; he expressed a wish to have pressure made on his chest, from which he said he derived comfort, but upon a bandage being bound round his thorax, it gave him great uneasiness, and he was soon equally anxious to have it removed.

Nov. 5th.—He had passed a most restless and distressing night, and when visited morning was found in a sinking condition; his extremities were cold, his pulse fluttering, and too feeble and rapid to be counted, and he died about eight in the morning.

Upon the next day his body was examined, when the following appearances presented themselves:—Externally there was only a slight abrasion to be perceived near the left anterior and superior spinous process of the ilium; no ecchymosis, except from leech bites, nor any lesion of the abdominal parietes; on opening the cavity of the abdomen, a large quantity of fluid, partly fæculent, but principally serous, was discovered; the peritoneum was extensively inflamed, most intensely in the left iliac region and over the bladder: in both of these situations the intestines were glued together. Upon minute examination of the intestines a laceration was found in the jejunum, which extended transversely through the bowel into the mesentery; the edges of the divided intestine were separated from each other, and the mucous membrane everted. In the cellular membrane, connecting the peritoneum to the lumbar muscles on the left side, a very considerable ecchymosis or infiltration of blood existed, and a similar extravasation was found about the pancreas.

The peculiarity which this case offers, is the absence of that decided collapse which usually follows such accidents; for although he complained of violent pain, increased by the slightest pressure, and attended too with difficulty of respiration, still the surface of his body remained warm, and his pulse was neither accelerated nor very feeble; his abdominal muscles were in a violent state of contraction, but yet it is said, that he had twice vomited. Such a combination of symptoms is rather anomalous at the first view; but still, perhaps, the absence of excessive collapse may be attributable to his full health, and the great vital power with which he was endowed; for it should be remembered, that the degree of prostration must essentially vary with the degree of vital energy of each patient. This case offered at once to the surgeon the readiest mode of practice; for as the patient had strength enough to support the necessary means to prevent the ill effects of subsequent inflammation, leeches were directly applied, and repeated, with the hopes of producing this desired effect, which, however, proved abortive, from the great size of the laceration through the whole calibre of the intestine. It is to be observed, however, that the patient did not suffer under hopeless symptoms, until a motion had passed, immediately after which the deadly collapse came on.

The following case is very similar to the last, although the bowel had given way in consequence of ulceration, the result of protracted disease. The patient was a gentleman, who lately had a large fortune left him, and which had produced considerable excitement.

CASE.

Mr. Joseph Stride, aged 31, was apparently in good health on the morning of Thursday, the 5th of September, 1833, on which day he made a very hearty meal, about two; at five o'clock in the afternoon he was seized with vomiting and an excruciating pain in the abdomen, which was much increased by pressure, particularly on the right side. His bowels had been open in the morning, but he said that they had been out of order for some time. He sent for his medical attendant, who finding him with a pulse at 80, a clean tongue, and the natural

temperature of the skin preserved, immediately ordered six grains of calomel and a grain and a half of opium, with directions to take an ounce of castor oil two hours after the pill.

At 10, P. M.—The medicine had produced no effect upon the bowels; pain of the abdomen increased; pulse quicker and rather smaller. Eighteen ounces of blood were immediately drawn, which produced fainting, but without affording any relief from the pain, four grains more of calomel were given, the castor oil desired to be repeated two hours after the calomel, and nine more leeches to be applied to the abdomen.

Sep. 6th, A. M.—The pain unabated; the bowels had not been relieved; the abdomen had become much distended, but scarcely amounting to tympanites; the vomiting continued. Two grains of calomel and eight of compound colocynth were then given.

At 12, M.—The pills had produced no effect; warm water was then injected into the rectum, which was returned without any fæculent matter. The pain in the abdomen unabated, indeed, rather increased in urgency, particularly upon pressure; the pulse had become more feeble. A drop of croton oil was now administered.

At 5, P. M.—Bowels not relieved, pain unabated, pulse very feeble, and the feet rather cold. At this period I was sent for, and found him with a very feeble pulse, sunken countenance, and his forehead bedewed with a clammy sweat. I ordered him three grains of solid opium and a castor oil injection. The opium produced no mitigation of pain, and he died at ten o'clock.

Upon examination after death the jejunum was found to have given way from ulceration, presenting externally a clear determined edge, without any eversion of the mucous membrane, which had, in fact, been destroyed by the ulcerative process. Plate 4, well delineates this distinguishing mark between an opening produced by ulceration and one by laceration. The edges of the ulcer, and consequently the peritoneum, were adherent to the omentum, but not sufficiently to prevent the escape of the contents of the bowel. The peritoneum was much inflamed over its whole surface, but especially on the right side.

Both these cases, I should say, deviate from that degree of collapse which usually attends rupture of an intestine; which collapse, however, does not seem to occur immediately upon the infliction of the injury, but at the period when the contents of the bowel makes its way into the peritoneal cavity, the degree of prostration being in proportion to the quantity and probably the quality of the matter extravasated.

CASE.

Michael Hayes, aged 40, was admitted into Guy's Hospital, in December, 1832, in consequence of a kick on the right side of the scrotum, inflicted by a man at eleven o'clock the night before. He was immediately after he had received the blow, seized with a violent pain in the direction of the spermatic cord, a sensation of faintness, cold perspirations, nausea, and every symptom of collapse; and in this state he remained for five hours without rallying, when he was brought into Guy's Hospital. Upon examination, it was found that he was the subject of an oblique inguinal hernia on the right side. The strictest enquiry was made, both of the patient and his brother, as to whether he had been the subject of hernia previous to the blow being received; and they both positively asserted, that there had been no swelling prior to the injury; the hernia was returned by the dresser with the greatest facility; but upon moving the man just afterwards, to place him in bed, it again descended, and was not attempted a second time to be returned, in consequence of the degree of pain which the slightest pressure produced. After being in bed a short time his pulse rose to 100, but more compressible, his respiration was hurried, his countenance indicated much suffering, and upon being asked where he felt the pain, he invariably complained most of the scrotum. Twenty leeches were immediately applied to the scrotum and groin, which was afterwards fomented, and an injection of gruel was administered.

At 8, A. M.—Has suffered considerable pain during the night, which he has passed in a most restless state; pulse 120, somewhat increased in power; the respiration was sixty in the minute; his abdomen is tympanitic, and he complains of excessive pain; his bowels have been freely opened, immediately after which he complained of great increase of pain and tenderness in the tumour in the scrotum. Forty more leeches were ordered to be applied over the abdomen and scrotum.

At 12, M.—Has vomited a dark grumous fluid since last report, and all his other symptoms remain unabated; his pulse has risen to 124, and is hard; the abdomen is extremely tender, notwithstanding the application of the leeches which have bled freely. The fomentations were ordered to be continued.

At 5, P. M.—The abdomen and tumour tumid and extremely painful; pulse 126, and with difficulty compressed. Bleeding to eight ounces was ordered, and twenty leeches to be applied to the abdomen and tumour.

At 9, P. M.—The sickness has recurred several times; the abdomen still continues tympanitic and extremely painful. A large blister was ordered to be applied over the whole surface of the belly, and a grain

and a half of calomel, with a half a grain of opium given every four hours.

26th, 8, A. M.—Has vomited almost incessantly during the night a dark grumous fluid; the tenderness over the abdomen and seat of the injury excessive; countenance very anxious, and sunken; pulse 120, very small and wiry; breathing sixty in the minute. Was ordered an enema of house medicine, and the julep ammoniæ in a state of effervescence, with opium.

At 10, A. M.—Is in every respect worse; pulse 128, exceedingly small, wiry, and intermitting; sickness continues; the countenance very much altered; he was, in fact, evidently dying. He lingered in this state until about two P. M. when he died.

Post mortem examination.—Twenty hours after death the body was opened; no lesion of the external parts presented itself; but on laying open the cavity of the abdomen the intestines were found to be highly inflamed, and agglutinated at every point by the effusion of lymph. Upon throwing air into the calibre of the intestines, by means of a blow-pipe, a rupture of the jejunum was discovered about an inch and a half above the internal ring, and through this opening a quantity of fæcal matter had extravasated and inflamed the entire peritoneal cavity, even upon the under surface of the diaphragm. The hernial sac was thickened and ecchymosed at its lower part, and contained a portion of intestine more congested than the rest of the canal. Drawings were made of the intestine and peritoneum, by Mr. Canton, and are preserved in the Museum at Guy's Hospital.

This case may be properly referred to that class of injuries to the abdomen, in which laceration of a viscus has occurred without solution of continuity in the parietes; subjected, however, to this distinction, that there had first been protrusion of the abdominal viscera into the scrotum, and that there the injury had been inflicted. This circumstance, however, forms no distinction, either in the diagnosis, prognosis, or treatment.

Immediately the patient had received the blow, it appears from the history of the case, that he was seized with all the symptoms of collapse, in which state he remained for about five hours, when he was admitted into the Hospital. Upon examination, it being observed that he was the subject of a scrotal hernia on the right side, and upon the most urgent and repeated enquiries asserting that he had never before been the subject of hernia, the dresser considered that the

protruded intestine might be the cause of all his symptoms, and therefore returned it into the cavity of the abdomen. Thus probably, either from the reckless negligence of the patient in concealing his rupture, or from a desire to make the case as strong as possible against the person who had injured him, he led at least to his quicker dissolution. It is more than probable that I should have adopted the same treatment, had I heard the history which he related of his case; and if I had, I should still make the same remarks as I am now induced to do, after a strict investigation of the facts.

The points in this case to be dwelt upon are, first, the improbability, if not the impossibility, of a scrotal hernia being produced by a blow upon the scrotum; and secondly, that the same blow could not effect the rupture of the intestine which the force had protruded; and therefore, it must be inferred that the patient had been the subject of a scrotal hernia before the accident. Under this conviction, I should lay it down as a rule that a person having received an injury of the abdomen, attended with symptoms of prostration, at the same time having a hernial tumour, that the contents of that tumour are not to be returned into the abdominal cavity; but that as soon as re-action has taken place, the strict antiphlogistic plan is to be adopted, leaving it to nature to repair the injury any viscus may have sustained; for should the contents of the hernial sac be injured, and even the intestine lacerated, as in this case, nature would immediately shut up the hernial, from the general cavity of the abdomen, and the contents of the bowel would be poured out only into the sac, indicated by the sudden swelling of the part, and the relief experienced by the evacuation. A cure is then to be obtained by opening the tumour, discharging its contents, and treating it as an artificial anus. It is by this process that nature sometimes effects a spontaneous cure of a strangulated hernia. Mr. Lawrence, in his work on ruptures, quotes several such cases; and a plaster cast, No. 2814 A,

in the Museum at Guy's Hospital, perfectly exemplifies the mode by which an unreduced strangulated hernia may thus be cured. I have little doubt that had the patient, from whom this cast was taken, applied for medical aid but a few hours before his death, that his life might have been preserved. There are in the Museum also several preparations of ruptured intestines, both from disease and accident, and to most of them a sufficient history attached, rendering them highly worthy of close examination.

The following cases are illustrative of the effects of injury to other abdominal viscera, independent of the intestines.

CASE.

Thomas Hawden, aged 21, a Carter, was admitted into Accident Ward, on the 15th of October, 1830, (at 5 P. M.) in consequence of a loaded waggon passing over his loins. The attendants stated that he spat blood on his way to the Hospital. When admitted he was in a state of extreme collapse, his pulse was small, weak, and labouring; his breathing frequent, difficult, and attended with a rattling noise, indicative of mucous in the bronchia; his countenance was pallid, and expressive of great anxiety; the surface of his body was cold; and he expectorated, at intervals mucus, tinged with blood; he complained of constant pain in the umbilical region. The vertebræ, ribs, and pelvis, were carefully examined, but no fracture could be detected. He was put to bed, and bottles of warm water were applied to his feet, which were icy cold.

At 8, P. M.—Pulse 100, small feeble, and fluttering. Not having passed any urine since his admission the catheter was introduced, and about six or eight ounces of urine tinged with blood drawn off; he has also passed a loose grumous stool, but no clear blood; he suffered from extreme restlessness, not being able to remain for a minute in the same position, although he had great intolerance to motion from the pain it produced. I ordered him thirty drops of tincture of opium in camphor mixture, to continue the warm water to his feet, and no further measures to be resorted to, while he remained in that depressed state.

At 10, P. M.—His pulse still 100, small, contracted, and wiry, resembling precisely the hæmorrhagic pulse; the other symptoms not at all alleviated; the rattling in his breathing continued. The tincture of opium to be repeated.

16th, 8, P. M.—Had passed a most sleepless night, and all his symptoms urgently aggravated; his pulse 120, small, and fluttering. From 10 A. M. he rapidly sunk, and died at six o'clock in the evening.

Examination.—The next day his body was examined, when on opening the abdomen about a pound of blood was found, appearing, at first, to have arisen from laceration of the spermatic vein; but upon further inspection, it was found to emanate from the spleen which was ruptured, so as to be divided into two parts, a portion being entirely torn away from its posterior and upper surface. The diaphragm was also ruptured a little above the œsophageal opening; and there was also an effusion of blood between the liver and peritoneum, in quantity sufficient to separate them to a considerable extent. The kidneys were in a like manner, separated from their peritoneal covering by blood. The stomach, bladder, and intestines, presented a natural appearance. The inferior part of the left lung was much altered in its appearance, and much gorged with blood. The heart was natural, but there was some effusion between the pericardium and the pleura. A larger quantity of mucus than usual was found in the bronchia. The brain was not examined.

The pathological facts connected with this case leads to many important questions, and amongst them it may be asked, whether the degree of collapse which followed the injury, depended upon the functional disturbance of the spleen (as an assistant to the respiratory organs), or merely upon the extravasation of blood into the abdominal cavity? Bearing in mind, that at the same time, the diaphragm was lacerated, and the lungs injured, as well as the spleen, the difficulty of respiration seems more attributable to mechanical violence than functional disturbance. Although this question is involved more with theory than practice, still, they should always be united, in every case where important functions are disturbed from injury, or disease of some distant organ; as by such means the uses of some organs may be ascertained. In this case I should consider that the cause of death was the severe mechanical injury the spleen and lungs sustained,—sufficient to account, both for the collapse, and the difficulty of respiration. The spitting of blood indicated the violent injury the lungs had received; and which could not have happened, had the respiratory function been disturbed, merely from the loss of the influence of the spleen.

CASE.

Samuel Pownes, aged eight years and a half, was admitted into Guy's Hospital in March, 1832, in consequence of a severe injury he had sustained from a blow on the abdomen. His father stated that the boy was "minding his truck" when a waggon heavily laden drove against the wheel of the truck, and swung it round with considerable violence, the handle striking the boy just at the junction of the cartilages of the eighth and ninth ribs, forcing him against the post of the gate-way, into which he had drawn his truck to get out of the way of the waggon. Immediately the boy had received the blow, he fell, but was able to rise and walk a few steps, but again fell, upon which he was conveyed to a surgeon's, who finding him in a state of collapse, gave him some stimulant, and sent him to the hospital.

At the period of his admission, nearly an hour after he had received the injury, he pourtrayed great anxiety, and pallor of countenance; coldness over the whole surface of the body, some pain in the abdomen, but which was not increased by pressure; his pulse could not be felt, but the heart's action was perceptible, although beating very feebly. He was immediately put to bed, wrapped up in blankets, bottles of warm water were applied to his feet, and friction used to restore if possible the warmth of the body. A small quantity of julep ammoniæ was also administered. Under this treatment he seemed somewhat to rally, but only for a few minutes, when he relapsed into his former state of collapse. Upon now being asked if he suffered, he said the "pain in his belly increased," and in spite of all efforts, he died twenty-five minutes after his admission.

Twenty-four hours after death, his body was examined.—Externally there was evidently some slight ecchymosis near the external extremities of the seventh and eighth ribs on the right side, and opposite to the last two ribs on the left. On opening the chest nothing particular was observed; but upon inspecting the abdomen, it was found to contain a very large quantity both of coagulated, and fluid blood, which seemed to have proceeded from the left kidney, the whole of which, above the renal vessels was torn from the lower part, which remained in its natural position. There was some ecchymosis on the liver, opposite to that on the chest, so that it appeared, as if the kidney had been lacerated, by the "contre coup," the boy's back being driven against the gate post, while the liver was merely bruised. The rest of the viscera were uninjured.

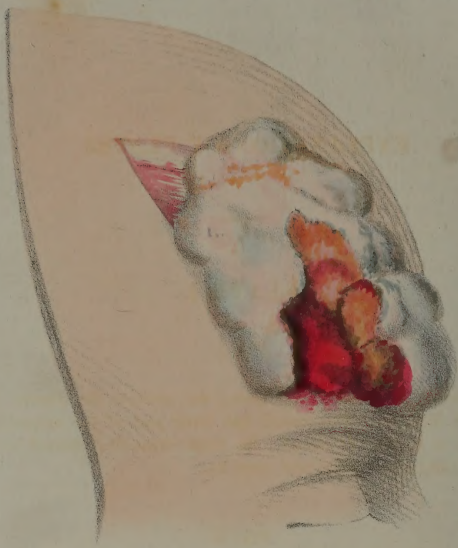
In consequence of the great depth at which the kidneys are placed, their rupture is an accident of comparatively rare

occurrence, and the diagnostic marks are rather difficult, particularly at first, until indeed bloody urine, and the situation of the pain, lead to the nature of the injury. The treatment in these cases, as in all the injuries of the abdomen, is to prevent or subdue peritoneal inflammation, which can only be effected by the strictest antiphlogistic means. In the foregoing case, however, collapse prevented the possibility of such treatment being adopted. It is evident that the cause of death was the extravasation of blood into the cavity of the abdomen, producing that degree of irrecoverable prostration, which is so strong a mark of injury to the abdominal viscera.

NOTE.—As a sequel to the case of James Morris, page 250, I may mention, that on Tuesday, September 24th, 1833, I removed with a pair of dressing forceps the whole head of the astragalus, including, therefore, the articulatory surfaces for both the tibia and fibula; it had been broken off from the lower portion of the bone, which remained attached to the os calcis, and explains how it happened that the dislocation could not be reduced, as whatever force was applied to the foot, acted in no way upon the projecting portion of the dislocated astragalus, which was in fact perfectly separated from the rest of the bones of the foot. The patient is doing remarkably well, and there is every reason to believe, he will recover with a very useful limb.

F. WARR, RED LION PASSAGE, HOLBORN.

1.



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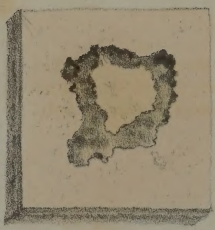

3.

Drawn & Lith.d by H. I. Shrapnell.

C. Bellamy lith. 26. Bridge Ho. Place Newington Causeway.

EXPLANATION OF PLATES.

PLATE I.

Fig. 1.

View of a Hernia Cerebri, from a wax model in the Museum of Guy's Hospital. The central and lower part of the protruded brain in a state of slough; the parts surrounding covered by a thin membrane. *Vide* case, page 24.

Fig. 2.

External view of a fractured portion of the Os Parietalis, showing the progress of separation. The groove formed around the dead piece of bone, caused by absorption from the dead and living edges.

Fig. 3.

Internal view of the same, showing that the progress of absorption has been more active on the internal, than on the external table; the edges of the bone being more rounded, and less sharp in their character.

EXPLANATION OF PLATES.

PLATE I.

Drawn & Lith.d by H.I.S.

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PLATE II.

Fig. 1.

View of a fractured Cervix Femoris, in which the periosteum was so little torn, as to preserve the fractured surfaces in perfect apposition, and yet no trace of ossific reparation had taken place. *Vide*, case, page 147.

Fig. 2.

The lower portion of the same, showing the cup-like cavity formed by the rotatory motions of the limb.

Fig. 3.

The upper portion of the same, showing the corresponding ball-like surface, which was received into the hollow part of the lower portion.

H.L.S. del.

C. Bellamy lith. 24, Bridge Ho. Pl. Newington Causeway, Southwark.

PLATE III.

View of a diseased Knee-joint. *Vide* case, page 147.

The patella has been sawn through, and turned aside in order to expose the ulceration in the cartilage, the thickening of the synovial membrane, and accumulation of albuminous matter.

J.d.C. Sowerby. C. Ellis imp. 24 Kirby St. Hatton Garden.

PLATE IV.

Upper Figure.—A view of an Ulcerated Intestine, to show the character assumed by the edge of the opening.

Lower Figure.—View of a Ruptured Intestine, contrasting the thickened and everted edges of a ruptured, or punctured, with an ulcerated opening.

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